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CLEVELAND, O., MAY 22, 1890.

THE WEEK IN IRON CIRCLES.

General Features. The railroad building record for the first four months of 1890 is not particularly reassuring to those who predicted a heavy increase this year. From January 1 to May 1, according to reliable figures, only 1,084 miles of new track had been laid. While explanation may be found in the fact that heavy snows in the Northwest and deluging rains in the South have retarded outdoor operations, some very active work will be required from now on to reach the estimated total of 6,000 miles before the end of the year. However, it may safely be predicted that 1890 will be a fairly active year for those whose business is related to the construction and equipment of new railways. A survey of the iron markets of the Central West shows a gradual bettering of the pig iron situation. In the South, particularly at Louisville, a quiet buying movement exists, in which purchases are made for long deliveries, buyers being willing to purchase for delivery during this year, on basis of $11.50 for No. 2 furnace at foundry. Southern furnaces report that the large stocks which were on hand between January and April have largely disappeared, and that by the first of June many furnaces will be in a condition of having no stocks whatsoever. One correspondent writes: "It is felt that the passage of the Silver bill will increase speculation in railway securities, which has always resulted in a large increase of construction of railways and purchase of motive power and equipment, and that, considering the enormous increase in consumption when the demand for railway purposes has been very light, it is evident that the increase of railway construction will greatly benefit the market." The consumption of iron continues heavy and the business outlook for manufacturers promising. At Cincinnati, there is an active business current at low prices. Comparing with the corresponding time last year, it is found that in Southern irons at least the volume of new orders and of shipments is largely in excess. The increase will probably average 50 per cent. This results partly from the practical suspension of business for two or three months at the beginning of the year, when sellers and buyers were so far apart, as to prices. At the close of the week, unusually heavy inquiries were before leading sellers amounting, in the aggregate, to over 12,000 tons grey forge and, perhaps, 5,000 tons No. 3 foundry and mottled. While the market East and North presents no features of encouragement, and the prevailing feeling is bearish, the situation West and South is as firm as at any time during the past month, and the heavy volume of inquiries from legitimate consumers is thought to give assurance that there will be no further decline for some time at least. There is a fair business in charcoal irons North and South and in Ohio softeners, but the heavy tonnage still runs to Southern coke irons. Our Detroit correspondents (W. F. Jarvis & Co.) write: "Very large transactions are reported for nearly every grade of metal during the past week. Several lots of Southern foundry and forge pig iron were placed at prices slightly higher than those of the early part of the month, clearly demonstrating that bottom was then reached. No concessions on quoted figures are possible at present. The consumption seems to be increasing, and a healthier outlook all through is observable. Lake Superior charcoal iron, which has shown no activity during the present month, was also stirred up to the extent of a number of orders of more than ordinary quantity, and inquiries at hand to-day, provided they are followed by prompt buying, will cause more selling in the month of May than any previous month this year. Stocks in the hands of consumers are known to be light, and it is predicted that between May 15th and July 15th a greater tonnage of Lake Superior charcoal pig iron will be placed than during any sixty or ninety days previously in the history of the trade. The market is stronger in nearly every grade." There has been a lively business in car-lots, 50-ton lots and 100-ton lots at Chicago, and two or three buyers have been negotiating for large-sized contracts. Prices remain very firm at the low level previously reported. Business is distributed between local furnaces, Southern irons and Ohio brands. There is evidence that should prices decline lower, a great deal of iron will be taken and stored for speculative accounts. Lake Superior charcoal irons hold up well, but the heavy buying by malleable and car wheel works has not begun. The large Northwestern agricultural works have not entered the market yet. Their requirements will be heavy this season. Indications generally seem hopeful and healthy. The St. Louis market has been quiet during the past week, with a regular run of small and medium orders at unchanged figures. Matters have improved a little in the Pittsburgh market since last report. Bessemer pig iron has advanced from 50 cents to $1 per ton, and mill iron, while not absolutely higher, is certainly firmer and in better demand.

Iron Ore. Vessels arriving at lower lake ports with cargoes of ore report unusual delays on account of the condition of the ore which, in very many instances, is frozen solid in the stock piles. No sales are reported, and there is no improvement in the demand. In reference to a Duluth opinion that "Lake Superior mines will produce all the ore they have sold, and the furnaces will be able to consume all they have purchased," it is in order to state that the first assertion is contrary to the facts, while the second is discredited hereabouts—right where the iron is made. The Lake Superior mines will not produce all the ore they have sold, for two reasons. One of these is the sale, bona fide but injudicious, of more ore in some instances than certain mines will produce, while another reason is found in the refusal on the part of the furnace interests to accept and pay for large quantities of new ore sold last Fall during the rush, upon a guarantee and analysis, neither of which is confirmed by the ore itself. These are potent reasons in confirmation of the reports that have appeared in these columns for the past month, and we will now venture the opinion that unless the daily receipts of iron ore at lower lake ports between this date and July 1, shall be very considerably augmented, the total receipts of 1890 will fall far below those of 1889.

Pig Iron. It is undeniably a fact that the tone of the market is stronger under the influence of pressing inquiries for large quantities of iron for Summer delivery. Makers of iron generally quote their product at fifty cents above the prices last cited, but no sales are reported at the new figures. There is a manifest disposition among furnace-men generally to hold on to their iron, in the belief that patience at this time will be rewarded by a golden harvest later on. The inquiry is alike strong for Bessemers and prime qualities of foundry iron, and the accumulation of orders that are bound to come when the buying movement sets in, will be large enough to employ most of the stacks for four months or longer. Coke is firm at $2.15, and the chances are that there will be no change before September 1st.

Merchant Iron. A slight improvement is noted in this market, bar iron selling at the Mahoning Valley mills at $1.65, which makes the price here—out of store—from $2 to $2.50 higher per ton. Wire nails, which last week were quoted at $2.15 at the mill, are now five cents higher, with two cents added for the f. o. b. feature. Plate is strong and high, and black sheets are improving.

TWO GREAT IRON DISTRICTS.

Ten years have wrought a marvelous change in the relative position of the Southern States as an iron-producing section, and a study of the figures is well calculated to strike the careful reader with amazement. In the following table we give the American Iron and Steel Association's figures for the past nine years, but for the sake of contrast we will go back to 1880, when the same States produced an aggregate of only 397,301 tons. In 1889, their grand total reached 1,556,702 tons, an increase over 1880 of 400 per cent. This is a marvelous advance, and all the world has taken cognizance of it. The figures alone will tell the story:

NINE SOUTHERN STATES.

States.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.
Alabama	98 681	112,765	172,463	189,664	227,438	283,859	292,762	449,402	791 425
Tennessee	87,406	137,602	133, 63	134,497	161,199	199,166	250,344	267,93	294 655
Virginia	83,711	87,731	152,977	157,453	163,782	155,250	175,715	197 395	251,356
West Virginia	66,419	73,20	88,398	55,231	69,0 7	98,618	82,311	95 259	117 900
Kentucky	45,973	66 522	54,629	45,052	37,553	54,944	41,9 7	56,790	42,518
Georgia	37 404	42 440	45,374	42,655	32 924	46,400	40,947	39 347	27,559
Maryland	48,756	54 521	49,153	27 342	17,299	31,502	37,427	17 6 6	33,347
Texas	3,700	1,32	2,381	5,140	1 543	3 250	4,383	6,587	4 544
No. Caro'ina	800	1,150	.....	43	1,790	2,200	3,640	2,400	2,858
Total	471,540	577,275	659 263	657,592	712,835	875,179	929,436	1,132,858	1,566,702

But while we regard with admiration this prodigious advance of the Southern States, we are not oblivious to the fact that there are six Western States that have a record of their own quite as remarkable. Let the student of figures carefully con this table:

SIX WESTERN STATES.

States.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889
Ohio	710,546	698,900	679,643	567,113	553,963	908,09?	975 539	1,103,818	1,215,572
Indiana	7,300	10,000	9,950	2,568	6,634	16,660	13,211	15,260	9,859
Illinois	251,781	360 407	237,657	327,568	327,9 7	501 795	565,453	579,3 7	601,035
Michigan	187 043	210 195	173,185	173,832	143 121	190 734	213,543	213 25	214,356
Wisconsin	102 029	85,859	51,883	52,85	24,632	65,933	133 08	116 037	158 034
Missouri	109,759	113,644	103,296	60,043	51,108	74,523	138,643	91,783	86,190
Total	1,368,498	1,479. 05	1,255,624	1,182,941	1,107,735	1,757,739	2,039,897	2 119,456	2,285,626

Here are only six States composing the "Central West," and excluding the great State of Pennsylvania, yet they showed in 1889 a production one and a half times as great as the nine States of the South. Although they held high rank in 1880, producing 1,194,084 tons, or three times as much as the Southern States in that year, they have steadily advanced in the line of progress until, last year, they doubled their record of ten years ago. Surely, an increase of 200 per cent. in ten years, in States already long established in the iron industry, is something quite as much to challenge the attention of the world.

Perhaps the contrast between these two sections will appear more strikingly when it is stated that the entire production of the nine Southern States for the past ten years has been 8,017,985 tons, while the six Western States have, during the same period, produced the enormous quantity of 15,790,606 tons, or nearly double the aggregate output of the former. Finally, the comparison shows that the Southern group turned out 18.3 per cent. of the entire production of the country in 1889, while the Central Western group produced 26.8 per cent. We commend these figures to those who may have lost sight of the fact that, while other sections of the country are rapidly building up, the great Central West continues its steady and uninterrupted progress toward industrial supremacy.

MANUFACTURERS AND THE CENSUS.

The answering of census interrogatories is considered by some manufacturers on a par with jury duty or assessors' blanks—a disagreeable necessity. As in the case of jury service and tax-listing, almost any excuse is offered to evade a very plain and patriotic duty, and the data furnished are often misleading because not sufficiently accurate for the purpose in view. This ought not to be the case. The value of the census report must depend wholly upon the accuracy and thoroughness with which manufacturers answer the questions propounded. The personal interests of every manufacturer are involved in the character of the report on manufactures. It will be quoted for the next ten years as the official announcement of the exact industrial condition of the country, and will be the basis for any future legislation that may be enacted in regard to the wants of our people, whether engaged in agricultural or mechanical pursuits. Therefore it is of vital importance to each manufacturer that an accurate report shall be made.

We are advised by the Superintendent of Census that he has taken every possible precaution in the preliminary work to make this census complete and satisfactory, and the earnest co-operation of those engaged in productive industry is all that is now necessary to secure valuable results. Every manufacturer should bear in mind that his answers to the questions relating to his business are held strictly confidential, are not disclosed to any competitor or to other persons, and are not used by the government as predicate for the purposes of taxation or license, or in any way to adversely affect his individual business. This assurance is printed on each schedule over the signature of the Superintendent of Census. The questions contained in the census schedules are those suggested by the manufacturers and other persons most interested in the progress of the country, and cover ground absolutely essential to the proper presentation of its industrial conditions and resources.

So far as *The Iron Trade Review* is concerned, it trusts that manufacturers will not only gracefully submit to the somewhat trying experience of revealing some of the secrets of their business to these faithful representatives of the Government, but will go further and assist them in all ways possible. Mr. Frank R. Williams is the special agent in charge of the work, and the work of collecting statisties will begin June 2d.

OHIO'S PLACE IN THE IRON-PRODUCING COLUMN.

Since 1872, Ohio has rapidly advanced into a commanding position as a pig-iron producer. While she has gradually relinquished the charcoal iron industry, from 95,622 net tons in 1872 to 22,467 tons in 1889, she has far more than made it up in bituminous coal and coke iron, so that she easily maintains second place and does not seem likely soon to lose it. The following table, taken from the annual report of the American Iron and Steel Association, just issued, graphically shows the history of the pig iron industry in this State for the past 18 years:

Years.	Charcoal--Net tons.		Bituminous coal and coke—Net tons.				Total. Net tons.
	Miscellaneous.	Hanging Rock.	Hanging Rock.	Mahoning Val.	Hocking Valley.	Miscellaneous.	
1872	8,182	87,440	23,169	152,756	.....	128,196	399.743
1873	8,133	92,365	28,607	136,972	.....	139,558	406 029
1874	6,962	88,873	26 015	121,403	.....	184,748	425,001
1875	4,558	57,413	36,899	115,893	1,250	199,780	415,892
1876	6,1 9	42,822	44,200	137,546	7,483	165,057	403,277
1877	1,965	40,212	44,544	136,526	23,895	153,316	400 398
1878	.....	33,518	31,137	134,400	65 690	156,251	42 991
1879	.....	43,445	43,097	137,844	51,9 8	161 457	447,751
1880	4,336	64 854	60,319	226,877	85,719	232,1 5	674,207
1881	4 082	61,487	77,500	245 737	88,146	232,0 94	710,546
1882	3,108	55 546	77 354	258 4 8	78,770	225 634	698,900
1883	2,324	38,134	82 455	244,265	48,433	263,959	679,643
1884	.....	24,880	64,781	240,288	24,1 6	207,038	567 113
1885	.....	18,018	68,837	236,078	50 481	180,549	553 953
1886	.....	16 161	116,398	350,178	57,867	367 490	908 094
1887	1,300	17 244	126 487	364,2 6	62 323	403,949	975,539
1888	.....	21,8?4	106,852	429 575	92 808	452,719	1,103 818
1889	.....	22,4 7	84,737	4 0,685	71,990	545,643	1,215,572

A marked decline will be observed in the production of the Hanging Rock district, after a vigorous effort in 1886, 1887 and 1888 to regain lost prestige by substituting bituminous coal for charcoal. The Hocking Valley also decreased its production in 1889. The Mahoning Valley increased its production, but the principal increase in Ohio in 1889 was in various sections of the State which individually have only a few furnaces but collectively have a great many.

Pennsylvania produced 49 per cent. of the total production of pig iron in 1888; Ohio, 14 per cent.; Alabama, 9 per cent., and Illinois 7 per cent. Every other State fell below 4 per cent. Of Ohio's 1,215,572 tons produced in 1889, 331,144 tons were Bessemer pig, Illinois and, of course, Pennsylvania outranking her.

At the close of 1889, Ohio furnaces carried 27,579 net tons of unsold pig iron, the Hanging Rock region reporting 6,843 tons, the Mahoning Valley 12,149 tons, and the Hocking Valley and miscellaneous districts, 8,587 tons.

Ohio's production of rolled iron of all kinds in 1889 was 475,120 tons, a considerable increase over 1888.

THE recent passage by the Dominion Parliament of an act authorizing the payment of a bounty of $2 per ton on all pig iron manufactured in Canada from Canadian ore, on and after July 1, 1892, for five years, does not strike the *Canadian Manufacturer* favorably. The present bounty is $1 per ton, and the duty imposed on imports of the article is $4 per ton. The American duty on pig iron is $6.72 per ton. Canada made last year only 30,000 tons of pig iron, while she imported 300,000 tons of iron and manufactures thereof. The point urged by the *Manufacturer* is that, if, instead of granting a bonus of $2 per ton, the Government had added $2 to the present Canadian tariff, making it $6, the result would be the establishment of additional blast furnaces for the smelting of Canadian ores that now remain undeveloped. There is sound political economy in this, and we are surprised that the Canadian Government does not see it.

So dampening has been the effect upon the British pig iron market of the presence of the huge stocks of iron ore in the public stores at Glasgow, Middlesborough and the West Coast, that the National

CONDITION OF THE BLAST FURNACES OF THE UNITED STATES.

May 1, 1890.

[CONDENSED FROM THE AMERICAN MANUFACTURER.]

LOCATION OF FURNACES.	CHARCOAL. Total No. of Stacks.	In Blast. No.	In Blast. Week'y capacity.	Out of Bl'st. No.	Out of Bl'st. Week'y capacity.	BITUMINOUS OR COKE. Total No. of Stacks.	In Blast. No.	In Blast. Week'y capacity.	Out of Bl'st. No.	Out of Bl'st. Week'y capacity.
New England	13	6	501	7	585	....	....	....	....	....
New York	9	3	403	6	747	4	3	2,265	1	1,151
Pennsylvania	17	4	315	13	728	1	0	0	1	1,017
Upper Susquehanna Valley	....	....	....	....	....	1	0	0	1	200
Pittsburgh	....	....	....	....	....	20	18	25,542	2	3,053
Spiegel	....	....	....	....	....	2	2	1,567	0	0
Allegheny Valley	....	....	....	....	....	2	1	531	1	125
Shenango Valley	....	....	....	....	....	20	15	11,434	5	2,856
Youghiogheny Valley	....	....	....	....	....	5	4	2,032	1	132
Juniata and Conemaugh Valleys	....	....	....	....	....	19	11	5,814	8	3,296
Spiegel	....	....	....	....	....	1	0	0	1	250
Maryland	8	2	207	6	565	4	3	2,845	1	140
Virginia	19	1	59	18	1,665	12	10	5,862	2	629
North Carolina	2	1	98	1	85	....	....	....	....	....
West Virginia	3	0	0	3	190	6	4	2,042	2	580
Ohio—Mahoning Valley	....	....	....	....	....	15	11	8,792	4	3,415
Eastern, Central and Northern	....	....	....	....	....	18	13	10,155	5	3,028
Hocking Valley	....	....	....	....	....	15	5	1,908	10	2,365
Hanging Rock	12	3	262	9	737	13	8	1,894	5	865
Miscellaneous	....	....	....	....	....	....	....	....	....	....
Kentucky	....	....	....	....	....	5	3	934	2	720
Hanging Rock	1	0	0	1	116	....	....	....	....	....
Western Region and Miscellan'ous	2	0	0	2	154	....	....	....	....	....
Tennessee	8	4	949	4	355	12	8	4,232	4	1,333
Georgia	3	2	275	1	98	2	1	510	1	675
Alabama	13	8	1,743	5	880	37	24	15,194	13	7,264
Indiana	....	....	....	....	....	2	2	334	0	0
Illinois	....	....	....	....	....	17	12	13,162	5	3,890
Michigan	26	12	3,967	14	4,578	1	0	0	1	300
Wisconsin	6	3	1,633	3	615	4	4	2,697	0	0
Minnesota	....	....	....	....	....	1	0	0	1	140
Missouri	2	2	615	0	0	6	3	1,678	3	1,720
Texas	1	1	180	0	0	....	....	....	....	....
Oregon	1	1	267	0	0	....	....	....	....	....
Colorado	....	....	....	....	....	2	1	805	1	519
Utah	....	....	....	....	....	....	....	....	....	....
Washington	1	0	0	1	205	....	....	....	....	....
Total charcoal and coke	147	53	11,474	94	11,703	247	166	120,529	81	39,503
Total anthracite	178	122	48,853	56	14,879	....	....	....	....	....

SUMMARY.

FUEL.	IN BLAST. Number. Month Previous.	Number. Year Previous.	Weekly Capacity.	Month Previous.	Year Previous.	OUT OF BLAST. Number. Month Previous.	Weekly Capacity. Month Previous.
Charcoal	53	51	60	11,474	11,167	11 951	94	100	11,703	12,335
Anthracite	122	121	103	48,853	49,713	35.078	56	59	14,879	15,559
Bituminous	166	174	138	120,629	126,676	91,239	81	73	39,503	33,106
Total	341	346	301	180,856	187,556	138,268	231	232	66,085	61,000

Association of Blast Furnacemen will probably soon vote to materially restrict production. Viewing the situation as it is, the *Colliery Guardian* says: "The present condition of the iron trade, at all events, calls for some drastic action on the part of the masters; whether they are willing to combine in their own defence against the inquitous warrant system remains, however, to be seen."

A GREAT gush of emotion will go up among iron manufacturers upon learning from the *American Metal Market* that pig iron warrants "have been dull and listless, the few quotations recorded at the Exchange including bids of not over $16 and offers at about $16¾; but without any promise of renewed speculation."

THE area of country bordering on and tributary to the Great Lakes, seeking the advantages of cheap transportation, exceeds 1,000,000 square miles. The coast line of the lakes is more than 2,000 miles in extent. The floating property employed on the lakes is valued at about $65,000,000.

INADVERTENTLY the statement was made in our last week's issue that the Lake Superior region produced 64 per cent. of the entire output of all the iron mines of the United States. Fifty per cent. would have been nearer the facts.

A LIST of Lake Superior mines paying dividends has been published. A list of non-dividend-paying mines would be equally interesting.

Iron Mines at Algeria.

The British consul-general, Playfair, in a report on the trade of Algiers, says: "Iron is the most important of all minerals found in Algeria, and generally occurs so close to the surface that it can be worked in open quarries. In the West it is generally close to the sea, but in the departments of Algiers and Constantine some of the most important mines are at a considerable distance inland. About 500,000 tons a year are exported."

TIN is reported to have been discovered in the Dutch Indies.

THE IRON MINES OF SANTIAGO DE CUBA.

BY U. S. CONSUL OTTO E. REIMER.

The existence of minerals of all descriptions and kinds in the province of Santiago de Cuba has been known since the conquest of the island by the Spaniards at the beginning of the sixteenth century, but they appear to have only paid attention to the gold and copper, for which they first employed the aboriginal Indians; and, finally, as these could not stand the hard work and were gradually dying out, they had recourse to the negro, and hence the origin of the Cuban slave-trade. On the conquest of Peru the news of the immense mineral riches there seems to have attracted the Spaniards from this place, and little by little mines here were abandoned without really having been worked with any degree of scientific knowledge or care.

Without further tracing the general history of mines and mining in this province, it is well to give a short review of the progress made, the concessions granted by the Spanish Government, the laws promulgated, and the present condition of the iron mines of this province, which form the subject of this report.

To Jose Ruig de Leon belongs the honor of having, on January 26, 1881, reported and claimed ("denunciado") the first iron mines in this province. These mines, situated in the district of Ramon de las Jaguas, and consisting of four squares of 1,000 meters each, were called "Las Lolas," and will be referred to later. The term "denunciar," or denounce, literally translated from the Spanish, means the act of legally establishing ownership of a mine, and is brought about under present law in the following manner:

The person discovering a mine, no matter on what land it is, whether on Government (realengo) or private property, submits to the provincial government a plan of the probable extension of the mine. The Government, then, if all is in conformity with details and fulfilling all the requirements of the law, grants a title to the mine. This title, however, does not take the surface property away from the owner. Later on, when the mines are to be worked, if no terms can be agreed upon between the owners of the land and the owners of the mines, the Government appraises the land, and at this appraised value the owner of the surface land is obliged to sell to the owner of the mine. (*Vide* my report on manganese mines, page 10, N. S., No. 1, January, 1889, Consular Reports.)

It seems that the impetus needed to convince the people here of the riches that were and are stored in their mountains was given by this act, and any number of mines were that year denounced. Mr. Ruiz de Leon entered into negotiations on April 12, 1881, with capitalists in the United States, and gave these capitalists refusal on the mines, agreeing to sell them for $500,000, with a cash guaranty of $25,000 down. A mining expert was sent here, and negotiations in that quarter falling through, Mr. T. H. Graham, M. E., appeared upon the scene. This scheme also failed, and instead, a syndicate of Pennsylvania capitalists bought, through Mr. Graham, the Juragua group of seventeen mines.

The aspirations and plans of mine owners being by this transaction assured of ultimate success in selling their iron mines to American capitalists, it became necessary to cause the mining law then in force to be amended, and, it might almost be said, reconstructed. The law of July 6, 1859, reformed by the law of March 4, 1868, did not offer sufficient advantages to purchasers of mines here to cause them to invest capital.

This state of affairs being represented to the Spanish Cortes by parties strong and influential enough to secure legislation, the law of April 17, 1883, was passed, which law secured to the iron-mining industry the same privileges, and possibly greater ones, than those enjoyed in Spain proper. Believing it of utmost importance to people seeking investments in iron mines here to have an intimate knowledge of this law, it is well to herewith include a brief sketch.

Article 1 of this law states that all grants and concessions granted by the law of October 13 (articles 77, 78, 79 and 80), and referring to mines in the island of Cuba, are extended for twenty years in the following manner: Such concessions and grants are exempt from the ground tax. All minerals and metals may be exported from this island free of duty. All stone-coal imported into mining districts through custom-house ports is exempt from duty, provided such coal is used for mining or metallurgic purposes and such purposes can be proven. Iron ore and iron mines are exempt from the taxation of 3 per cent. on gross product heretofore imposed. Mining and metallurgical industries pay no taxes or duties whatever. Mining products of this island are also exempt from taxes of transportation, coastwise or other, but always are subject to the rules imposed by the custom-house.

Article 2 provides that the importation free of duty is conceded on material and machinery used in mining and metallurgic industries, and also on such material which is used for the transportation of such products and their conveyance on shipboard; this concession to hold good for five years from date of the publication of this law, and can not be prorogued. (By a subsequent law the date and length of this concession was prorogued.)

According to article 3, vessels entering in ballast and leaving the ports of this island with iron ore pay navigation and port charges on the basis of 5 cents per ton.

Each ton imported of mining material or machinery, or of material used for metallurgical industries, pays $1.30 (Spanish) port charges. All other cargo on such vessels pays according to the regular customs tariff. To enjoy this privilege, vessels must prove and justify their entry or departure with mining material or machinery, or ore or mineral.

The tonnage of foreign vessels is fixed according to their register; Spanish vessels pay according to their documents. This, of course, does not include foreign vessels of such nations as are equalized by treaty with the Spanish as regards tonnage dues, and have, under royal order of June 4, 1868, which gives to Spanish vessels these privileges, the same rights.

While the law of October 13, 1863, is declared to be still in force, the law

above quoted changes it so materially in its vital points that it is unnecessary to refer to it in this report.

On April 27, 1885, the General Government of this island published the charter and concession granted to the Juragua Iron Co. (limited) through the ultramarine minister of Spain, at Madrid. This concession allowed the Juragua Iron Co. (limited), of Philadelphia, Pa., U. S. A., to construct a narrow-gauge railroad from their mines to Santiago de Cuba for the sole use of their mines and mineral, this railroad to pay neither taxes nor charges for the term of ninety-nine years. The free entry of material for constructing and maintaining the railroad, rolling stock, and all and everything needed for the use of the road to transport mineral is included in this grant. Of the minor and trivial details imposed by the Government in consideration of this grant it is unnecessary to speak, as they are such as can be easily complied with by any company establishing itself here on the same basis as the Juragua Iron Co., and grounding its demand for a charter from the Spanish Government on the grants given to the above-mentioned company by such Government.

This grant has caused various mine owners to demand from the Spanish Government like privileges, and, convinced of the willingness of such Government to further the mining industry, other grants for mining, railroads, and the establishment of entry and clearance ports in the vicinity of other mines have been asked for and conceded, thus making the preliminary work—which is always the most difficult for companies and capitalists desiring to work mines—easy in the extreme, and entirely free from the long and discouraging delays in obtaining concessions which characterizes such work here.

These facts, combined with the most favorable laws, above quoted, prove sufficiently the desire of the Spanish Government to further the mining industries, and insure its success, and should induce parties seeking investments in iron mines to consider and examine the wonderful mineral wealth of this province. That such wealth exists has been amply proven by the work of the Juragua Iron Co., here. The ore is, it might be said, not mined, but simply blasted, and, with picks and shovels, removed by cutting in the hillsides. Of the work of this company, their exports and benefits they have given this province, later on reference will be made.

It would require the pen of a scientist to describe the geological formation of the ore deposits in this province; suffice to say opinions differ as to the formation and strata. The southern coast of this province, from Cape Maisi to Cape Cruz, is mountainous in the extreme, and is traversed parallel with the coast-line by a high mountain ridge, called the Sierra Maestra. This range is partially broken by the bay of Guantanamo, some 50 miles to the eastward of here, and this bay of Santiago de Cuba. In the foot-hills, between the bay of Guantanamo and Santiago de Cuba, which foot-hills run from the general mountain range down to the coast, nearly all the mineral so far discovered has been found. This, however, by no means proves that these foot-hills are the only ones containing iron ore, as ore has been found to the westward of this harbor, and lately immense deposits have been discovered directly on the coast, within a few hundred feet of an excellent harbor on the north coast of this province, between Baracoa and Nipe Bay.

Some weeks since concessions were granted for the construction of a mining railway from Baconao to Santiago de Cuba. This railway, on which preliminary surveys have already been made by a Spanish Government engineer, would benefit the whole system of mines so far reported and claimed along the south coast of this province, and offers no serious obstacles as regards the topographical formation of the land. Branches running to the main line, and constructed in the numerous small valleys that allow the mountain streams to wend their way to the coast, can easily connect all the mines included in the system with the bay of Santiago de Cuba, and thus facilitate the transportation of iron ore. This concession (the main line would be some 30 kilometers long) has been granted to Jose Bueno y Blanco, Esq., who is at the head of the syndicate that are waiting for American capital to go ahead with its work.

Another plan, extensively referred to by T. H. Graham, Esq., M. E., in his report on group No. 5 of the mines, is to construct a short mining railway, some 4 to 10 miles long, to the lagoon of Boconao, and then connect the lagoon with the sea by a canal, thus allowing sea-going vessels to load ore in the basin thus formed. This scheme would also benefit group 7.

The Lola group of mines (in No. 7) having been under negotiation, and their sale being almost assured, a Cleveland, O., capitalist brought down here some of our best engineering talent, and it was agreed to construct an artificial port in the bay of Daiqueri, some 2 to 3 miles from the road. The plan has reached its completion up to the point that during his recent visit to this province the captain-general of this island inaugurated the port in the writer's presence.

Another plan, benefiting group 5, is to construct a port at Juragua, which would, no doubt, involve great expense.

The Spanish Government has granted the concession of establishing a custom-house for clearance and entrance of vessels at all these three ports, Baconao, Lola Daiqueri and Juragua.

DESCRIPTION OF THE GROUPS.

First Group.—Nima Nima, 359 hectares.

Second Group.—Cuero, 312 hectares.

These two groups, comprising 671 hectares (1 hectare = 2.471 acres) are to the westward of this bay of Santiago de Cuba, and have been little known and offered to capitalists in the United States. Suffice to say, unless the ore finds an outlet at an artificially constructed port at Aceredero, it must all be brought to the western shore of this bay for shipment. The construction of a railroad along the coast-line offers no serious topographical difficulties.

Group No. 3.—La Dorotea, 240 hectares. Of the quality and kind of the mineral in these mines I have not been able to collect any information. Should such ore be of the same kind and quality as that of the Jaragua mines, their close proximity to this port renders them a highly desirable investment. The same may be said of group No. 4, Sevilla and Ocana, 510 hectares.

Group No. 5.—Arroyo de la Plata. In Mr. Graham's report, above referred to, that gentleman speaks very highly of these mines, ranking them amongst the foremost of the world, and estimating the amount of ore actually in sight requiring no development whatever at 500,000 tons. The amount of ore below the surface, that gentleman further states, is absolutely beyond conjecture. In his estimate he only includes one of the six properties included in this group.

Group No. 6.—Juragua and Victoriana, 1,497 hectares. This group has given substantial proof of the wonderful riches of the Cuban ore range, as it includes the mines worked by the Juragua Iron Co. (limited), who export their mineral to Philadelphia, Baltimore and Perth Amboy. It is well to here give the standard analysis of the ore, which analysis may be taken as a standard of the ore in the whole range:

Constituents.	Per cent.	Constituents.	Per cent.
Silica	1.90	Phosphoric acid	0.06
Carbonic ac'd	0.98	Titanic acid	
Peroxide of iron	95.65	Potash	
Alumina	0.55	Organic matter	
Lime	0.67	Total	100.53
Magnesia	0.15		
Manganese oxide	0.50	Metallic iron	66.95
Sulphur	0.07		

This company owns 780 hectares of mines, which they bought for $300,000 (Spanish gold), with the agreement of paying a royalty of 5 cents per ton of 2,240 pounds exported, and has constructed, under concessions and laws before quoted, a mining railway 17 miles long, main line; branches and sidings, 24 miles. They at present own a rolling stock of 1,000 ore cars, 585 small side-dump cars, 16 flat cars, 2 passenger cars, 8 large and 6 small locomotives, and are working five mines in thirty-two workings, and have up to date exported:

	Tons.
1884 (part of)	23,777
1885	80,090
1886	112,780
1887	92,910
1888	204,225
1889 (to date)	218,556
Total	732,338

At present employing some twelve hundred men in the mines and two hundred on the railroad, they are of immense advantage to this province, and have, it might be said, rejuvenated this part of the province and have given an immense impetus to trade and navigation.

The ore, all shipped in steamers under the British flag, is conveyed by rail to the company's dock at La Cruz, where it is dumped into the steamers from the cars. The writer is informed that the company contemplate constructing another track, and thus can increase the output of ore immensely. The only difficulty with them lies in the fact that while sufficient ore is always ready and need only to be blasted and taken from the mountain-sides, the transporting facilities are not sufficient to cope with the enormous demand for this wonderfully rich ore.

The railroad was inaugurated on July 17, 1884, under imposing ceremonies, having been finished on June 29 of the same year. The first shipment of ore was made to Perth Amboy on August 7, 1889.

The stockholders of this company are largely composed of strong capitalists in Pennsylvania, and the ore is shipped for use of the Pennsylvania Iron Co., of Steelton, Pa., and the Bethlehem Iron Co., of Bethlehem, Pa.

It is estimated that $2,500,000 were spent in this enterprise; which enterprise, for its able management, strong financial position and willingness to comply with the laws of the country, is a credit to American enterprise.

Groups 7 and 8.—Owing to their close proximity to the Juragua properties, these groups do not need any especial mention. The ore seen on the surface of these groups is of almost fabulous quantity, easily reached and offers an excellent investment to capitalists.

Group No. 9.—Moa, 463 hectares. These mines, not included in the southern ore belt of this province, but situated on the north coast, between Mangle Point and Sagua de Tanamo, deserve special mention in this report, not alone for their wonderfully advantageous position—being on the shores of a magnificent harbor—but also for the fact that their discovery, made a short time ago, is conclusive evidence of the existence of iron ore on the north coast. The ore, so far as can be ascertained, here is wonderfully free from phosphorus and sulphur, is easily mined, and the fact that the port, whose shores are in many places iron ore, is one day's sail nearer our shores, deserves a careful and special study. The writer has been so impressed with the feasibility of working these mines, that he proposes, with the Department's permission, to visit them and make a careful study of them.

After perusing this report, the question is naturally asked: How is it that with mines richer than those of Spain, more easily and cheaply reached than our own on Lake Superior, no more American capital is invested here? This question is easily answered by the fact that our public have been in almost absolute ignorance of this mineral wealth, and the owners of the mines, believing us all in command of untold riches, have asked fabulous and ridiculous prices for their mines. Those American capitalists that have come here have been obliged to leave without buying mines, on account of the stubbornness of the mine owners, who have refused to sell at any thing like reasonable figures. This, however, is to-day to a great extent changed, as people here are convinced that, no matter how rich their mines, unless they realize on them, they are worth nothing; and they are to-day willing and glad to listen to any reasonable offers.

In closing, it is well to refer to a question of great moment and importance. The population of this province, in number of its working people, inadequate even now to supply the increasing demand for laborers in sugar estates and mines, is unused and often unwilling to perform hard labor, such

as mining. Considering this question a most vital one, the writer had, some time since, a conversation with Captain-General Salamanca, when that gentleman was here. That authority is fully alive to this critical situation, and has already taken steps to encourage emigration from Spain, with excellent results. Besides this, the soldiers on this island can be employed as laborers in the mines, and are so employed with the Spanish Government's consent. The labor question, of great moment to sugar planters, need offer no obstacles to the working of mines by American capitalists.

The writer hopes that this hurried review of iron mines in the province of Santiago de Cuba will serve to draw the attention of our public to this wonderful country.

At the instance of Thomas H Graham, Esq., I had the honor of presenting, on February 21, to their excellencies, the civil and military governors of this province, a committee composed of Edmund D. Smith, Clarence M. Clark, David H. Thomas, E. V. D'Invilliers and S. H. Chauvenet, which committee was accompanied by the following mining, railroad and engineering experts: W. J. Rattle, Capt. E. D. Greene, Edward Gaynor, John Gaynor and John Cooper. This committee represented an American syndicate, and visited Santiago de Cuba for the purpose of investigating and making preliminary examinations with the view of establishing an iron mining enterprise in the vicinity of this city.

The committee represented a large and important syndicate of American capitalists, as before stated, and, upon being by me introduced to His Excellency Don Ramon Barrios, civil governor, and His Excellency Brig. Gen. Don Andre Gonzales Munoz, military governor, received from both authorities the official assurance that the National Government of Spain, at Madrid, had instructed them to do all in their power, by granting special concessions and in every other way possible, to encourage the full development and operation of mining interests in the island of Cuba, and that, in furtherance of these instructions, their excellencies further assured the committee of their hearty support and co-operation. This is another and marked instance of the friendly policy adopted and pursued by the Spanish Government with the view of encouraging the establishment and protecting American enterprises in this consular district.

TIN-PLATE.

BY JACOB REESE.

The amount of tin and tin-plate imported into the United States in 1889 was 743,147,640 pounds, which, at an average cost of six cents per pound, would amount to $44,588,858 40. To manufacture this amount of plate will require one hundred first-class rolling mills; it will require 463,835 tons of pig metal; 927,670 tons of iron ore; 265,048 tons of lime stone; 331,311 tons of coke; 110,437 tons of basic lime; 28,607,321 pounds of lead for the tin-plate, and 26,006,323 pounds of tin for the tin-plate; 13,950 tons ferro-manganese for deoxidizing; 331,311 tons of coal for steam and heating; 24,848,250 feet of lumber for boxing; 1,282,412 pounds of nails for boxes, together with a considerable amount of oil and bran, sulphuric acid and other chemicals. It is now a well-known fact that nearly all the tin and tin plate made in the world is made from basic ingot iron, and, for the benefit of those who contemplate entering into the manufacture of tin-plate after the passage of the tariff, I wish to say that I am now prepared to contract for the delivery of 1,000 tons of basic ingot iron per week. It will be especially adapted to open-hearth melting stock for the production of a fine quality of boiler plate. I can deliver it in ingots of any shape or weight not over ten tons (20,000 lbs.) each, in slabs, billets, blooms and bars for tin-plate, and will be pleased to name prices to all parties who contemplate using that kind of stock.

400 CHESTNUT ST., PHILADELPHIA, PA., May 19, 1890.

Great Guns!

Says the *American Artisan*, of Chicago: The active warfare in which the *American Artisan* has for some time been engaged in favor of cheap tin-plate, seems to have created quite a spasm among those patriotic individuals who have axes to grind, in the shape of shares in tin ore mines or positions to retain as monopolistic apologists. Throwing facts to the winds, covert abuse and misrepresentation are the weapons upon which these inflationists have relied to prop up their untenable position and enable them to pose as patriots *sans peur et sans reproche*. The diatribe of the Cleveland monopolists' organ was quickly followed up by a stroke of enterprise on the part of a Chicago weekly, which apparently at the suggestion of a New York trade publication whose management is interested in the Dakota tin ore mines, republished an illustrated and glowing description of those bonanza deposits. An hysterical demand for protection against imported sheet iron and sheet steel appeared in the same issue, the paper evidently believing that by demanding the "whole hog," a portion, at least, of the animal's carcass would be secured.

Iron Workers' Demands.

A dispatch from Pittsburgh, May 20th, says: The main talk among the iron workers in all the union iron mills is the work of the amalgamated convention, which will open up in this city two weeks from to-day. The main question at issue this year will be an advance of 50 cents asked by the puddlers, which is to come from the firm, and a change asked by the roughers on guide roll in their wages will advance them about 5 per cent., which is to be paid by the rollers. The puddlers claim that if the finishers will not ask for an advance, which is to raise boiling to $6 per ton on a 2-cent card. Some of the finishers are willing to concede the puddlers' demand irrespective of their own request.

AT the Bookwalter Experimental Works, new appliances are being prepared which will permit the metal to be poured directly from the converter into the moulds without teeming it in pots. The slag is separated by an ingenious device.

PETROLEUM FUEL.

A curious impression seems to have gained ground to the effect that the Standard Oil Company does not want to sell oil for fuel. It may be stated authoritatively that the company is not only able but willing to sell and deliver oil for fuel purposes in any quantity that may be desired. It is now delivering oil for fuel purposes in 14 States of the Union. For its sales in Chicago, and the West and Northwest the delivery is by tank-cars from the terminus of the pipe line at South Chicago, to which point it is pumped from Lima, O. The Chicago price is 1⅔ cents per gallon or 70 cents per barrel of 42 gallons, f. o. b. cars at Chicago. It is estimated that for forge or furnace fires, or in brick kilns a barrel and one-half of oil equals a ton of coal.

Oil is being successfully and economically used to a very considerable extent in this city and throughout the West. Among the manufacturers using this fuel are the Illinois Steel Co., Chicago Steel Works, Capitol Manufacturing Co., Calumet Iron & Steel Co., Chicago Anderson Pressed Brick Co., Chicago Arc Light & Power Co., Chicago Brick Co, Chicago Drop Forge & Foundry Co., Chicago Copper Refining Co., Chicago Forge & Bolt Co., Chicago Glass Manufacturing Co., Chicago Tire & Spring Co., Chicago Union Lime Works, Crane Bros. Manufacturing Co., Fowler Rolling Mill Co., Liquid Carbolic Acid Manufacturing Co., May, Purington-Kimbell Brick Co., Phœnix Distilling Co., Pullman Palace Car Co., Union Brick Co., William Fallon & Co., Wahl Bros., McCormick Harvester Machine Co., Dolese & Shephard, Union Drop Forge & Foundry Co., National Forge & Foundry Co., East Chicago Horseshoe Co., C. A. Treat Car Wheel Works, Gormley & Jeffrey, Northwestern Horse Nail Co., Chicago Crucible Steel Casting Co., and hundreds of others.

A great many of the manufacturers here and throughout the Northwest are beginning to use crude petroleum as a substitute for soft coal. It is smokeless, for the fine spray of oil which comes from the injector consists of such minute drops of the liquid, and is so thoroughly mixed with oxygen that when it burns the combustion is complete, and only steam and carbonic acid gas go up the chimney. Not a speck of soot comes from the smokestack or soils the white-washed purity of the boiler room. It is absolutely clean. It is labor-saving, too. No fireman has to keep shoveling coal, the flues do not have to be cleaned every week or so, there are no ashes to be dragged out from under the furnace, and there are no clinkers to clog up the bars. One man by turning a valve may regulate the heat of a battery of fifteen boilers. One man in the Union Steel Works, of Chicago, does attend to sixteen boilers. In the McCormick Harvester Works the forge fires are not covered with hoods to draw off the acid smoke of burning coal as in the old days. The fires are open and there are forty of them white hot, as white as an arc light, without a trace of smoke. One man can make nearly four times as many welds in a day, by one of these forges as he could when they used coal fires. Not only is it cleaner than coal and calls for less labor, but it is actually cheaper as a fuel. A barrel and a half of crude oil is equal for furnace fuel to a ton of the best bituminous coal, and at 70 cents a barrel anyone can easily calculate the advantages petroleum has over its smoky rival.

Just three years ago, when the fuel oil industry was first projected, it was cried down because, as its enemies claimed, there wasn't enough oil fuel to be obtained in America to supply the New York City factories alone, to say nothing of other territory, and because of the high prices for oil that were sure to follow its substitution for coal fuel. Since then, the industry has experienced a magnificent success, the sales exceeding 20,000,000 barrels a year, while the price is lower than ever.

Death of the Inventor of the Steam Hammer.

Mr. James Nasmyth, inventor of the steam hammer, died on Wednesday, at Bailey's Hotel, South Kensington, in his 82nd year. Deceased, who until recently had enjoyed remarkably good health, had in the last few months been suffering from illness, and his death is ascribed simply to old age. He was born at Edinburgh in 1808. He left his residence at Penyhurst, near Tunbridge Wells, about a month ago, and had since been staying at the hotel where he died. The Nasmyth family is of great antiquity, having held property in Tweedale since the thirteenth century. Deceased's father, Alexander Nasmyth, was the well-known landscape painter. At an early age James acquired a strong taste for engineering through his friendship with a schoolfellow at Edinburgh, whose father was a large iron-founder. In 1829, he came to London, and was engaged by Mr. Maudslay, founder of the large engineering firm, at a salary of 10s. a week. About two years after Mr. Maudslay died, and Nasymth returned to Edinburg, and in 1834 he started in business in Manchester. As his undertaking developed he removed to Patricroft, four miles from Manchester, where he founded the extensive workshops known as the Bridgewater Foundry. His invention of the steam hammer followed while he was engaged on a contract for the Great Western Railway, at Bristol, in connection with a paddle-shaft for a steamship, when it became necessary to forge a very heavy iron shaft which no existing machinery could turn out. He also invented other implements now widely used in engineering work. At the age of 48 Nasmyth retired from business, and since then had devoted its attention principally to astronomy.—[London Iron & Steel Trades Journal.

Change of Date.

The Kensington Land Co., Kensington, Ga., whose sale of lots was announced for June 3, 4 and 5, announce a change of date to July 1, 2 and 3. Prospective investors will govern themselves accordingly.

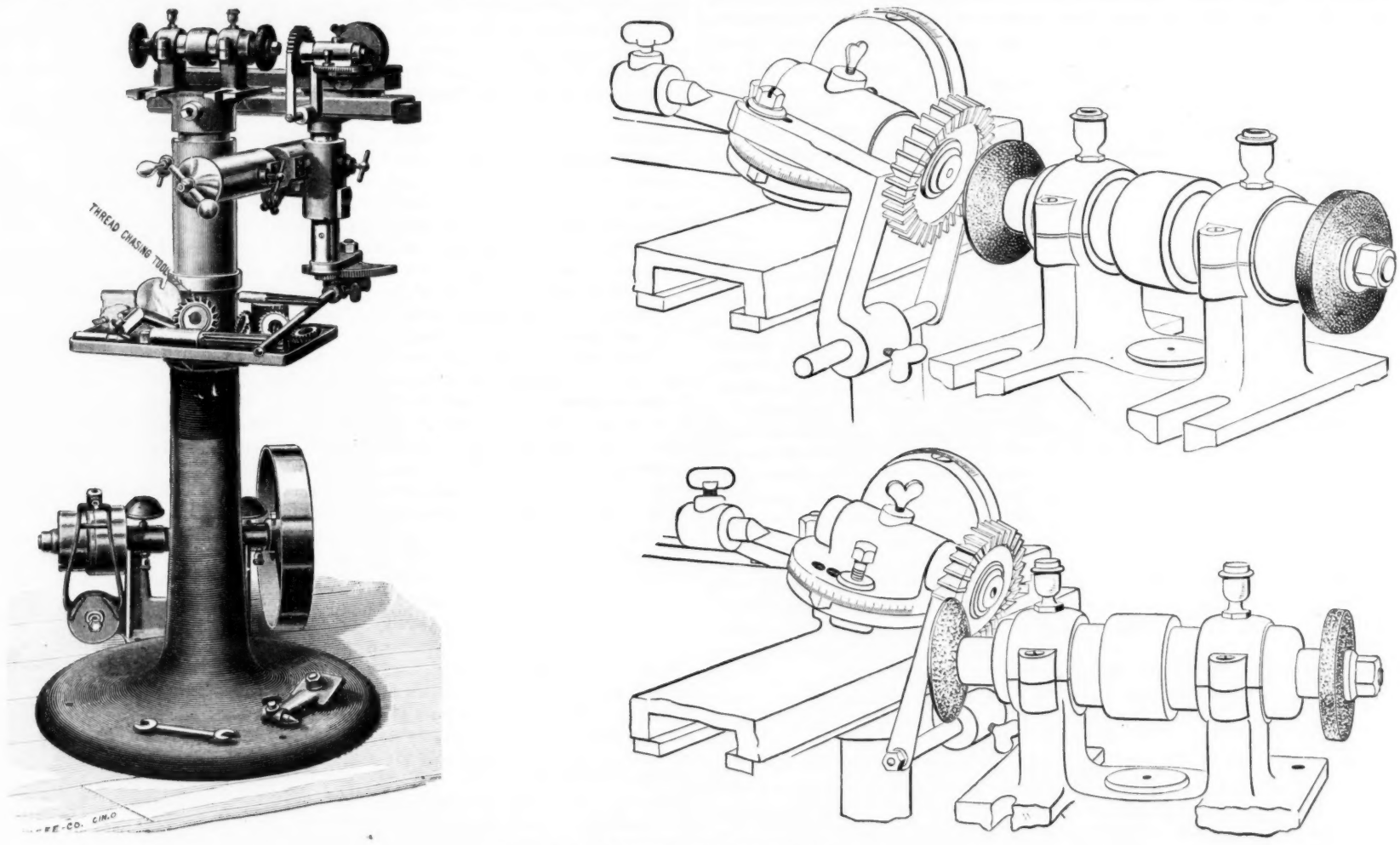
MOSCOW, the ancient capital of Russia, is to be this Summer the scene of a Central Asiatic Exhibition that will remain open for four months. All kinds of native produce, manufactures, arms, minerals and animals will be displayed, and foreign manufacturers of agricultural implements and other goods suitable for this vast region will be free to exhibit.

UNIVERSAL CUTTER AND REAMER GRINDER.

This machine is provided with all adjustments necessary to grind reamers and milling cutters of all shapes up to 8 inches diameter, such as face mills, angular cutters, end mills, spiral mills, slitting saws, taper and straight reamers. It is perfectly universal. It differs from other machines, from the fact, that it will grind everything specified without the use of special attachments, and that all work is done on a horizontal slide. Those familiar with grinding cutters and reamers, are aware that the adjustment of the tooth-guide for angular and face mills, and taper reamers is a difficult one, because the tooth to be ground must be in an exact parallel line with slide. This difficulty is overcome in this machine. No attention is required to adjust tooth-guide to proper height, as it is centrally fixed for all diameter of cutters and reamers. In grinding work the tooth-guide travels with the cutter. It is made spring-like, acting like a pall and ratchet. This is a very positive and rapid way of passing to next tooth. The side teeth of angular cutters and face mills are ground off with a practically straight line clearance. This is done with a cup-shaped emery wheel on left side of the machine. Three or four-inch wheels can be used. The advantage to grind side-teeth with a fair-sized emery wheel, and at the same time grind a straight line clearance, is known to those who have heretofore been compelled to use a small wheel.

By reference to the accompanying illustrations, it will be seen that the table can be swung clear around on the column and that the work can be brought in contact with the emery wheels on either side of the machine. A face mill may have the top teeth ground off on one emery wheel, and the teeth of one side on the other, without taking cutter off the arbor or disturbing tooth-guide. This feature of swinging table around column, permits work to be brought into contact with wheels in the most favorable manner for rapid grinding and preventing heating of the cutter. The table is moved forward and back by means of slide and lever. This lever can be placed to suit the position of the operator. The adjustment toward the emery wheel for continuous cuts is by means of screw. Table is elevated or lowered by means of rack and pinion; is 21½ inches long, will take in between centers 15 inches, and has a horizontal movement of 10 inches. It is provided with adjustable dogs for stops on each end. It may be swung at any angle for taper work. The work holder or swiveling head swivels both vertically and horizontally for clearance, and work at an angle. All adjustments of table and head are indexed by degrees. The spindle runs in hardened and ground steel bearings. It is provided with dust caps and adjustment for wear. It has but one speed, as all the work is ground on three or four-inch wheels, and the adjustment is such that with a three-inch wheel, the clearance obtained may vary from a three-inch to eighteen-inch circle, or more, according to the angle at which slide passes wheel on right side of machine. Endless belts may be used, as whole spindle head may be moved up or down for adjustment. A hand rest is furnished for turning off wheels, grinding gear cutters, etc. The detailed cuts show the machine in various positions for different kinds of grinding, and are self-explanatory.

These machines are manufactured by the Cincinnati Milling Machine Co., corner Second and Plum streets, Cincinnati, O., who will give all desired information.



UNIVERSAL REAMER AND CUTTER GRINDER.

A NAILLESS horse-shoe is made at Sheffield, England. The shoe is held on the horse's hoofs by means of a number of iron clips, the pointed projections from which go slightly into the hard surface of the hoof and prevent the shoe from slipping.

Hardening Iron and Steel.

Watson Smith read at the meeting of the London section of the Society of Chemical Industry, a paper by G. G. Theodossieff, on "A New Process for Hardening Steel and Iron." The process consist in the employment of glycerine for tempering these materials. The specific gravity of the solution of glycerine may be varied between 1.08 and 1.26 at 15° C. by adding water according to the composition of the steel. Its temperature may also be varied between 15° C. and 200° C. according to the hardness of the metal, it being found advisable to employ a high heat for hard steels. To increase the quenching power of the bath various salts may be added to the glycerine solution, manganese or potassium sulphate being added when a hard temper is required, and manganese chloride or potassium chloride for a softer temper. The advantages which the author claims for his method are, (1) the temperature of the aqueous solutions of glycerine may be varied within wide limits, as the boiling point of pure glycerine is 290° C.; (2) the variation in the quenching power of the solution by dissolving these salts in the liquid has a very marked influence on the degree of temper, and renders it possible to treat very different qualities of steel by this method.

Three specimens of steel were exhibited—(1) in which no shrinkage was shown, proving that it was applicable to steel which had not been forged; (2) a specimen which had been bent on itself cold, and having a tensile strength of 65 tons and an elongation of 15 to 18 per cent.; and (3) a piece of forged steel that had been tempered by this process. The composition of the steel from which these samples were prepared showed on analysis that it contained 0.7 per cent. carbon, 2.2 per cent. chromium, and 0.15 per cent. silicon. The author, who is engaged for the Russian Government, states that the authorities have adopted this process, and succeeded in making a 12-inch projectile hardened by this process, break through a 16-inch armor plate.

A New Roofing Material.

A new roofing material is mentioned in the German papers, in the shape of a sort of metallic slate, similar to those used amongst us, but enameled so as to be proof against moisture or acid vapors. Metallic slates of tin and galvanized iron have long been used in Germany, and galvanizing has been pronounced by the highest scientific authority there to be the best protection against rust that has yet been applied to iron, but it is acknowledged that the bending necessary to form the locking joints of the metallic tiles is apt to throw off the protecting covering, leaving the iron exposed to corrosion. In order to provide against the bad effects of this, the new plates are made of sheet iron, stamped into shape in the usual manner, and are then dipped into an enamel paint, which, when heated, forms a continuous coating, unaffected by acids or alkalies. It is too soon to say how long a roof laid with such a material will last, but it promises to be of considerable value.—[Glasgow Engineer.

THE Krupps have concluded arrangements for the purchase of the entire village of Alsendorf, which they propose converting into a vast workshop.

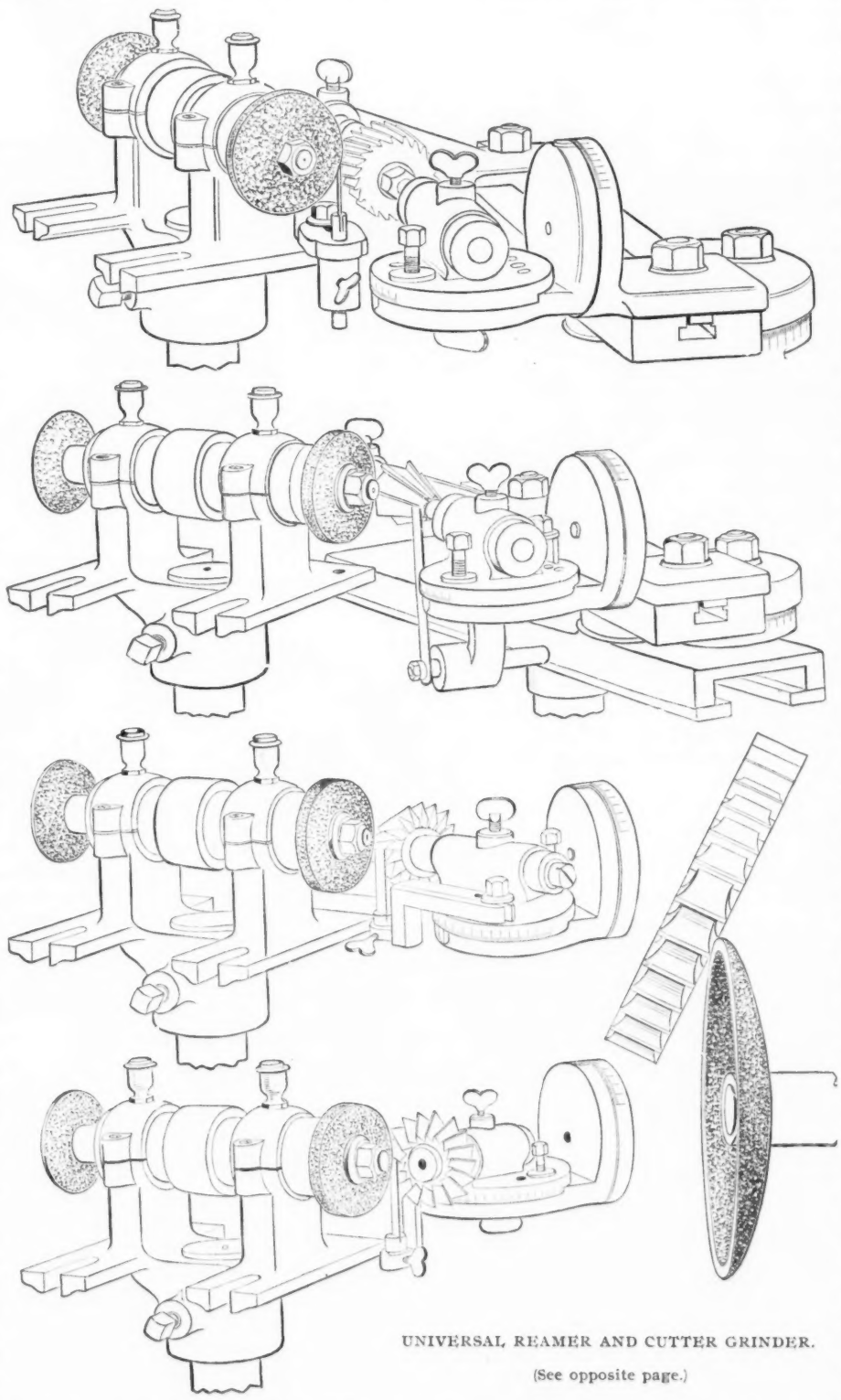
THE FIRST AMERICAN TIN MILL.

An interesting account of the mill of the Glendale Tin Mining Co., the first tin mill established in the United States, and from which is now being put out the first fruits of the Dakota tin mines, is given in the Rapid City *Republican*. That paper states that the mill is located on Iron creek, about 22 miles southwest of Rapid City, at the foot of the mountain in which the mines are situated. The mill proper measures 50 feet in width by 100 feet in depth, and is divided into three stories. It is unique in plan, compact and convenient, well built in all particulars, and protected from all danger of fire, both by a system of water pipes and by having roofs, etc., covered by a thick asbestos coating.

Either steam or water power may be used for running the machinery. The steam equipment consists of two 100 horse-power boilers and a 100 horse-power high speed engine. The water power equipment consists of a flume 20 by 24 inches in section, bringing the water from a dam on Iron creek, one and one quarter miles distant from the mill, giving a head 100 feet pressure at the wheel. About 500 miner's inches of water are supplied to the turbine wheel, which was manufactured by Craig, Ridgeway & Co., of Coatsville, Pa. The water power will be used except during short, cold snaps in the Winter, the engine being placed in the mill as reserve power in case of accidents.

The ore is hoisted from the main shaft, and dumped first into an ore bin of 200 tons capacity, located high up the mountain over the mill. From this bin it is conveyed to the mill by a wire rope bucket tramway, the loads going down hill to the mill, hauling the empty buckets back to the mine. The ore buckets mechanically deliver their contents into a 175-ton ore bin, above and back of the mill. The large lumps of ore are crushed, first by a Gates crusher, then passed through a dryer to a set of Gates improved Cornish rolls; thence elevated to a set of rotary sizing sieves. From the sieves the finer sizes are conveyed to a set of Paradox, concentrating tables, and the coarser sizes tocommon Hartz jigs. The screens, jigs and concentrators separate completely all of the mica, quartz and feldspar, leaving clean concentrates of cassiterite or oxide of tin, ready to be smelted into bar tin. The concentrates are, for the present, being shipped to Chicago to be smelted, but it is the intention of the company to erect at once a smelting plant in the hills. The first shipment of concentrates to Chicago yielded 65 per cent. of metallic tin, and the second shipment 68 per cent.; and it is expected that with more practice they will yield over 70 per cent.

The main vein measures from 28 to 32 feet in width at the outcrop, and over 40 feet in the lower working. There is no doubt as to the true fissure character of the vein, as it cuts the slates at nearly right angles, and has well defined polished walls with a thick clay gouge or cleaveage. The vein stuff is principal albite (white feldspar), with here and there white, glassy quartz. The black crystals of tin oxide are disseminated all through the vein material, varying in size from crystals weighing an ounce or more to those as fine as grains of pepper. Assays and tests from the different workings give an average of over 3 per cent. metallic tin, while picked or specimen rock is often blasted out that will yield over 30 per cent. of the white metal. With these large bodies of ore, and the excellent facilities for mining cheaply, there is no question but that the present mill, with a capacity of crushing and concentrating 100 tons of ore per day of 24 hours, will soon be supplemented by a still larger mill.



UNIVERSAL REAMER AND CUTTER GRINDER.

(See opposite page.)

New Forging Process.

The distinction between melted metal flowing into molds by gravity, and being forced into molds by pressure, when only softened by heat, is not so great as people imagine. The first is as old as civilization, the latter is a new process, developed and made possible by implements of recent invention. All over the world press forging is increasing. Presses to exert thousands of tons are now common, and the most intricate forms are produced by the flow of metal heated only to redness, the same as it would be for hammering. Even here in San Francisco a good many things are being forged by pressure that were formerly cast, notably the parts of "cable grips" and like things are produced by "presses," nearly as cheap as castings of malleable iron or steel. The latest thing in such forgings are railway axles. Blanks of a uniform section are placed in dies which form a matrix having the form of a completed axle, with its necks and collars. Powerful plungers, driven by hydraulic force, act on the ends of the blank forcing or "flowing" it into the mold, just as castings are made of fluid metal. The work demands celerity to prevent cooling by radiation, but the process is, no doubt, a practical and economical one.

No Necessity for Tall Chimneys.

A mechanical engineer, recently, in a conversation regarding the accident to the Clark Thread Co.'s chimney expressed himself as believing that "the time will come when these tall chimneys will serve no more useful purpose than that of monuments to the folly of their builders." The fuel used in a manufactory costs too much to allow twenty five per cent. of it to escape up a brick shaft to "warm up out doors." It is true that the gases must leave the boiler at a comparatively high temperature, but there are factors entering the boiler at a much lower temperature to which this heat could with advantage be transferred. In the feed-water and the supply of air to the furnace much of this heat may be directly returned to the boiler itself while, by its application to the reheating of exhaust steam, fitting it for heating and manufacturing processes; to the intermediate cylinders of compound engines, and directly to purposes useful in the arts the necessity for the direct combustion of an additional amount of coal to supply heat for these purposes is avoided. But, it may be urged, it is in the very direction of allowing of a considerable cooling of the furnace gases that tall chimneys are built, for, to gain a sufficient draft with comparatively cool gases, the chimney must have excessive height or area or both. To such an observation the gentleman quoted referred to the high rates of economy realized in marine practice where anything like an approach to a tall stack is out of the question. In his opinion, future development will be in the direction of regaining from the flue gases every possible unit of heat, and the maintenance of the draft not by the maintenance of a tall column of hot gas but directly by mechanical means. Mr. Hoadley has shown that the heat derivable from the gases is more than practically equivalent to the power required to operate a fan or blower to supply air to the furnace. If this proves to be true in general application we may dispense with the expensive and often unsightly tall chimney, obtain a better control of the air supply to the furnace, and prevent any tendency to leakage of cold air through the setting by maintaining in the furnace and combustion chamber a pressure geater instead of less than that of the atmosphere.—[Steam-Power.

The Eiffel Tower in a Storm.

On the afternoon of May 9, the Eiffel Tower in Paris, was subjected to a remarkable bombardment from aerial electricity, being struck by lightning no less than six times in 11 minutes. Three of the flashes are said to have reached the top of the conductor simultaneously, resulting in a remarkable display and considerable vibration on the part of the big iron frame. A rattling of the metal was heard, but no damage seems to have been done.—[Electrical Review.

ELECTRICITY moves, it is claimed, 288,000 miles per second.

AMONG THE IRON MINES.

Lake Superior Mining Notes:—

MARQUETTE RANGE.

A company known as the North-east Negaunee Mining Co. has been organized to operate on the "forty," lying north-east of the Negaunee mine and adjoining the Baraga forty. Stock certificates will be issued in a few days and a limited amount sold to further prove up the property, upon which valuable ore has already been found. Those interested are very sanguine of success.—[Iron Herald, Negaunee.

GOGEBIC RANGE.

A new find is reported from the Anvil of a big vein, 75 feet in width, in a crosscut to the north.—[Spirit.

The reported sale of the Eclipse mine to the Wisconsin Central syndicate, afterwards denied, turns out to have been correct. Preparations for mining on a considerable scale are going forward, and the ore will be shipped over the Lake Shore road for the present in Central cars, until the latter road is extended from Bessemer down into the Wakefield district.—[Record, Ironwood.

The Federal has been for the past few days crosscuting the vein of ore on their lower level—something over 200 feet down. At last accounts they had penetrated twenty-four feet of clean ore, with no signs of the hanging wall in view. From a property, which sold two years ago to pay labor claims, the Federal is developing into a full-fledged mine, and is certainly proving a bonanza to its present owners.—[Pick & Axe.

There seems to be a pretty general understanding in mining circles that the Eureka (Danglers) mine is under option to the Wisconsin Central Co. for about $100,000, and it is well worth the sum, that is to say the controlling interest, which is all the railroad people are after. It looks as if this Central syndicate was eventually to control all the mines along the east end of the range. It is reaching out with a strong hand.—[Record, Ironwood, Mich.

Another interesting rivalry is that between the three big mines, the Chapin, Norrie and Ashland. The first is the Menominee's champion, and really employs more men than either of the Gogebic twins. There are 1,800 men on the Chapin's roll, it is claimed, or several hundred more than are claimed by either the Norrie or the Ashland. Right there, however, the Chapin's boast ends. Either of its competitors, with smaller forces and at less expense, is a larger producer than the Chapin. The close of the first two weeks, by the way, found the Ashland leading both the others, with the Norrie a close second.—[Ashland Press.

MENOMINEE RANGE.

Supt. Bankes is making innumerable costly but well-advised improvements at the Ludington, including shaft-sinking and many noticeable surface changes. The Ludington is bound to be one of the big 'uns, and will employ fully 1,000 men next year.—[Mining News.

The property known as the Night Hawk, on Sec. 18, near the Mastodon, has been taken hold of by J. Q. Adams, of Negaunee, who will put a diamond drill at work to further prove the property. A shaft and cross-cut has shown up some very fine ore, in place.—[Iron Ore.

The big shaft at the Hamilton is down 1,300 feet and will soon strike China, though ore was struck at a depth of about 900 feet. The new shaft is down some 400 feet in a sort of granite rock, and bids fair to rival its big brother to the southwest in time.—[Mining News.

J. F. Shafer is negotiating for the option of the Quinnesec mine, and if he secures it, will commence exploration at once. Mr. Shafer believes there is plenty of ore yet on the Quinnesec property, and will not confine his explorations to the old mine. The *Range* hopes the venture, if entered into, will be a lucky one.—[Range.

A correspondent of the Florence *Mining News*, who visited the Chapin, Ludington and Hamilton mines the other day, found things booming at each of the three great properties, especially, however, at the Chapin. The Chapin's immense open cut, west of the railway tracks, presents a scene of busy activity, over eighty teams and several hundred men being engaged in the gigantic task of stripping a piece of ground 125 feet wide and 300 feet long. The work is carried on both day and night. Ore was encountered at the west end of the pit at a depth of only about sixteen feet, though it was believed to lie much deeper.

Work at the Sheridan mine is being pushed along as fast as possible, but is only of a preparatory nature. The main or hoisting shaft is now down about fifty feet, having been sunk that depth in the past month. It is the intention of the management to sink the shaft down about 100 feet and then form a "level" by drifting into the body of the ore, thus following the advice of the *Diamond Drill* of several weeks ago. The shaft is being sunk in the hanging wall and is being well timbered and planked up, and is now assuming the appearance of a mine. The bottom of the shaft is in a mixture of ore, quartz and graphite—a good indication, of itself, that a larger body of ore existed in the vicinity, and would warrant the prosecution of the work, even if former exploratory work had not already demonstrated that fact.—[Drill.

Among a half-dozen or more promising iron ore explorations now in full and active operation in the Florence district, the Angus Smith find, on section 24, 40–17, is by no means the least important. An examination of the Keyes Lake country, the name generally given to that part of the district, will convince the most skeptical that therein lies the richest mineral lands in Florence county, if not upon the entire Menominee range. The iron formation is as regular and even as anything of the kind ever seen, and extends north and south for miles. On one side are the slates; on the other the soapstone, while other kinds of rock, such as usually abound where there is iron, are found in abundance. Midway between is the ore, and it is not necessary to dig deep into the bowels of Mother Earth to find the metal either. The main shaft at the Smith exploration is down about twenty-five feet, and is bottomed in fine, perfectly clean ore, which, it is said, comes within the Bessemer limit. Several car loads of this kind of ore has been hoisted, and it looks as though by the time the shaft is down from 75 to 100 feet, and drifting commences, there will be enough to load a good-sized train of ore cars. Another shaft is going down 800 to 1,000 feet south of west of the first shaft, and this was also bottomed in ore at a depth of eight or nine feet. The deposit at the latter shaft is thought to be a lens of ore, as the regular vein runs almost north and south. Mr. Smith has a mine almost to a dead certainty, and if there is one iron mine in that rich and wonderful mineral district, there are a dozen. It cannot be otherwise.—[Mining News.

Lake Superior Shipments of Iron Ore:—

Lake shipments of iron ore from the mines of Lake Superior, for the season of 1890, up to Wednesday, May 14th, are as shown by the appended statement, condensed from the Marquette *Mining Journal:*

MARQUETTE RANGE.

Barnum	626	Imperial	1,225	Pitts. & L. Angeline	31,399
Buffalo	7,252	Jackson	10,894	Prout	1,223
Cambria	11,230	Lake Superior	34,571	Queen	8,010
Champion	23,649	Lillie	4,991	Republic	22,448
Cleveland	23,687	Lucy	4,655	Salisbury	5,303
Cliffs Shaft	14,950	Milwaukee	4,177	South Buffalo	4,100
East New York	3,650	Michigamme	6,337	Volunteer	9,577
Humboldt	1,112	Negaunee	5,400	Winthrop	13,993
Total, Marquette Range					254,368

MENOMINEE RANGE.

Armenia	3,829	Great Western	8,671	Norway	6,939
Chapin	82,207	Hamilton	1,385	Paint River	4,222
Commonwealth	11,785	Iron River	14,818	Perkins	168
Cyclops	8,510	Ludington	2,737	Shafer	4,433
Dunn	15,408	Mastodon	8,053	Vulcan	18,380
Florence	16,927	Millie	3,371	Youngstown	3,313
Total, Menominee Range					214,556

GOGEBIC RANGE.

Albany	2,200	Colby	23,016	Norrie	81,915
Anvil	4,906	Father Hennepin	1,223	Pabst	10,643
Ashland	42,594	Germania	4,579	Palms	2,759
Aurora	21,245	Iron Belt	9,640	Section 33	8,194
Brotherton	5,022	Montreal	2,385	Trezona	5,392
Cary	3,669	Mt. Hope	9,036	Windsor	2,519
Total, Gogebic Range					241,058

VERMILION RANGE.

Minnesota Iron Co	47,365	Chandler	14,764
Total, Vermilion Range			62,129
Grand Total			772,111
To corresponding date of 1889			660,919

It will be noticed that the Gogebic range is crowding its older rival, the Marquette, hard, and is considerably ahead of the Menominee. The gain in this year's shipments to date is almost entirely from the Gogebic range.

Effect of Temperature on the Magnetism of Iron.

It was natural to suppose that as heat weakens the strength of a steel magnet, the susceptibility of a magnetic substance would increase with a fall of temperature, as also that bodies which, in ordinary thermal conditions, are neutral to magnetic influence, would exhibit magnetic properties if cooled down sufficiently. This point was dwelt upon by Dr. Hopkinson in his remarkable address to the Society of Electrical Engineers, and was also made the subject of experimental demonstration by Mr. Shellford Bidwell in his recent discourse on "Magnetic Phenomena" at the Royal Institution. The substance used was an alloy of nickel and iron. Both these metals are magnetic at ordinary temperatures; but the alloy is perfectly neutral. A permanent magnet is unable to lift a strip of it; but if cooled a few degrees below zero, the strip is at once strongly attracted by the magnet. It is inferred that all metals would exhibit magnetic properties if cooled below this critical temperature, but of this, in the words of Dr. Hopkinson, "we have at present no indication." Mr. Bidwell also used on this occasion the very delicate apparatus which he has constructed for accurately studying the effects of a varying magnetising force on bars of iron. He took up the subject where Joule left it in 1845, and showed that the bar lengthens at first, then contracts, becoming ultimately shorter than its original length. Joule's greatest magnetising force was 120 c. g. s. units; Mr. Bidwell has carried his to 1,000 c. g. s. units. The corresponding elongations and contractions were rendered plainly visible to a numerous audience in the usual optical way by the motion of a spot of light upon a distant screen.

Scheme to Establish Big Tin-Plate Works.

Half a million dollars will be invested in the erection of a tin-plate mill in this vicinity, if the McKinley tariff bill passes, says a Pittsburgh dispatch of May 20. It will be one of the largest in the world. J. Davis Lewis, formerly a tin-plate manufacturer in Wales, is at the head of the projected enterprise. Free sites, coupled with cash gifts running all the way to $50,000 have been offered by the rival localities to secure the new enterprise. Pittsburgh has the call, Mr. Davis says, because it is the center of the iron and steel trade and the natural gas region. Mr. Davis says the prospects for the American tin-plate industry are magnificent, if the McKinley bill passes, in which event his company will build immediately.

Interchangeable Mileage Ticket.

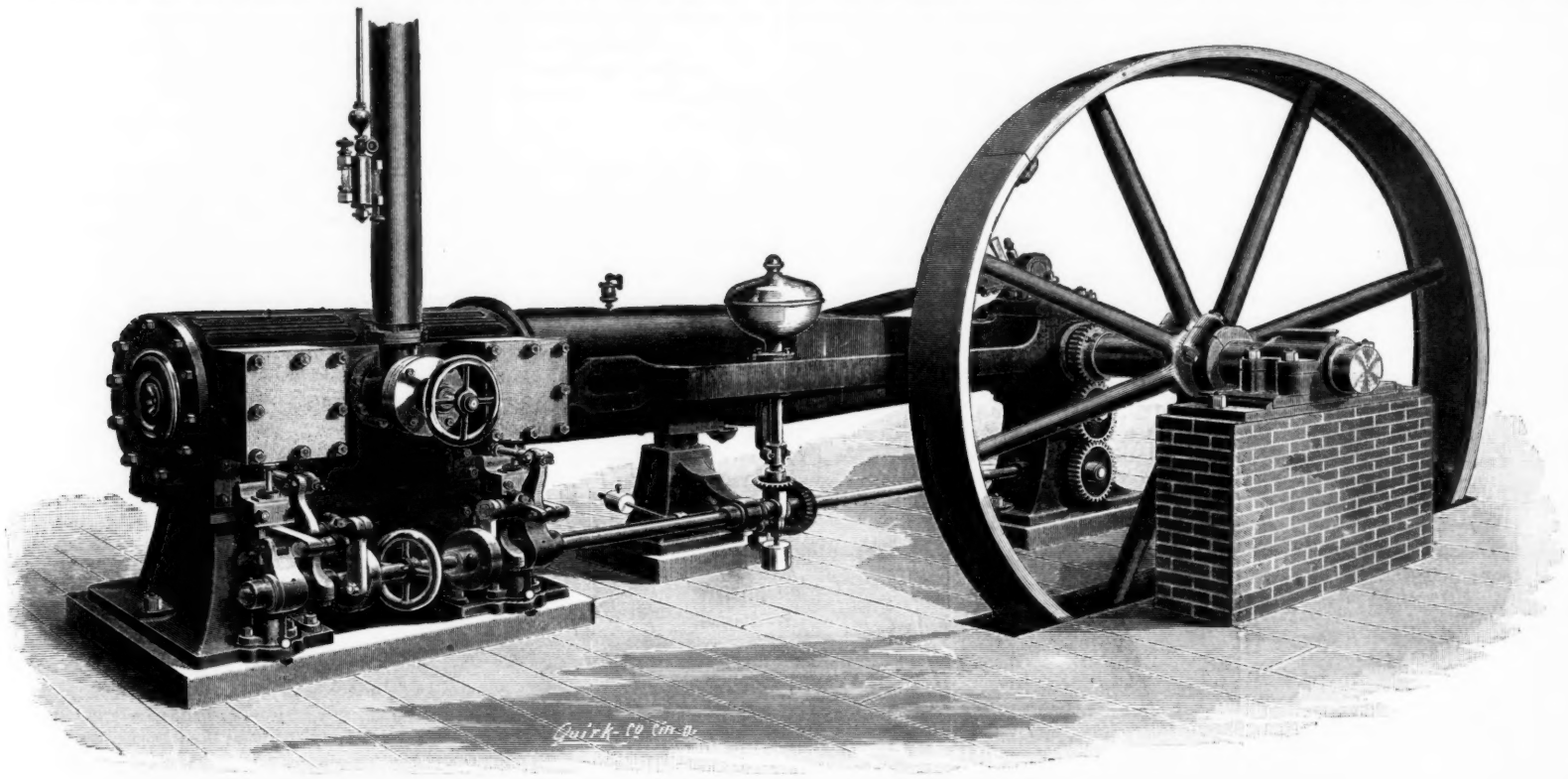
The Wheeling & Lake Erie Railway has prepared and placed on sale at its principal stations commercial tickets, 1,000 miles, good over thirteen different roads, for the accommodation of its patrons. These tickets, with full information as to the territory they cover, can be obtained by calling on any agent of the Wheeling & Lake Erie Railway. Small stations not provided with a stock of this issue, will be authorized to receive orders for same, making requisition on the general passenger agent for what may be required.

A MINIATURE coal palace made from 38,000 pieces of coal and 5,000 pieces of glass is on exhibition at Trinidad, Col.

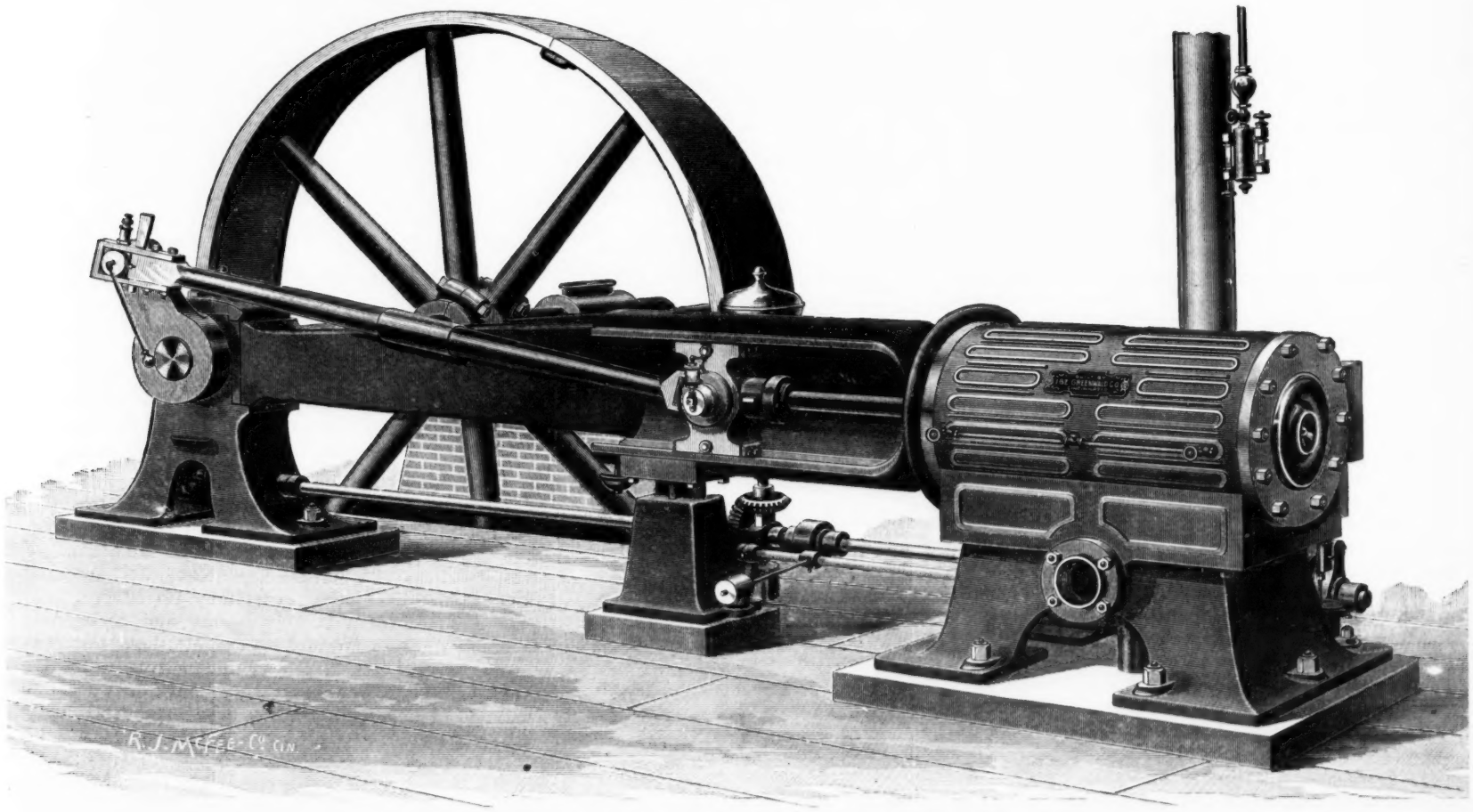
GREENWALD AUTOMATIC CUT-OFF ENGINE.

The following description of the Greenwald automatic cut-off engine is taken from the published circular:

"In this engine the instantaneous closure of the cut-off valves (aside from the action of gravitation) is made positive by the action of the steam pressure upon the area of the valve stems, the shock of the closing movement being noiselessly received (after ports are closed) by air cushions provided for the purpose. This arrangement secures, as above stated, a positive action of the cut-off valves at any desired rate of piston speed. As the steam pressure within the chests and the cylinder are identical at the time of disengagement, there is no friction of the valve against the seat to retard its prompt closure. The valves are plane plates sliding upon plane surfaces, presenting opposing surfaces so distributed that no shoulders are worn thereon by the variable travel of the cut-off valve. The principle of plane-sliding surfaces involves the least wear and tear, and in practice has a self-trueing tendency, affording a guarantee of perpetual tightness and efficiency. Plane-sliding valves are so well known, their great durability and other good qualities so unquestionably an established fact, that mechanics and engineers justly regard them as the highest standard in use. Each valve has several ports or openings, a suitable number being provided to insure a prompt and ample area to maintain the closest approximation to the boiler pressure within the cylinder, up to the point of cut-off, in the case of the steam valves, and afford the greatest possible freedom from back or counter pressure on the exhaust side of the piston, in the case of the exhaust valves. Each valve is thoroughly and completely independent of its fellow, both as regards actuation and adjustment, hence the most precise adjustment of the valves possible in modern automatic cut-off engine practice can be made. One is not forced to stop at the best average or to split the difference, as is the case where the valves are not independent as regards actuation, but can proceed to the most vigorous and exact conditions. The valves are actuated by a cam-shaft, common to all, which has a coincident rotary motion with the main crank shaft. The steam valves are moved by separate eccentrics, having sufficient angular advance to insure a quick, opening movement. The exhaust valves derive their movements from separate 'wall-cams,' the peculiar shape of the same giving to the exhaust valve ports a very quick opening on the exhaust side of the piston, the valves remaining at a rest during the greater part of the piston's stroke, and closing quickly just as the stroke is completed, the ports being closed and the valve remaining stationary during the following steam stroke of the piston. The valves do their work under very favorable conditions as regards the power required to move them, and the wear and tear on the actuating mechanism, for economical and other reasons connected with smoothness."



REAR VIEW.



GREENWALD AUTOMATIC CUT-OFF ENGINE—FRONT VIEW.

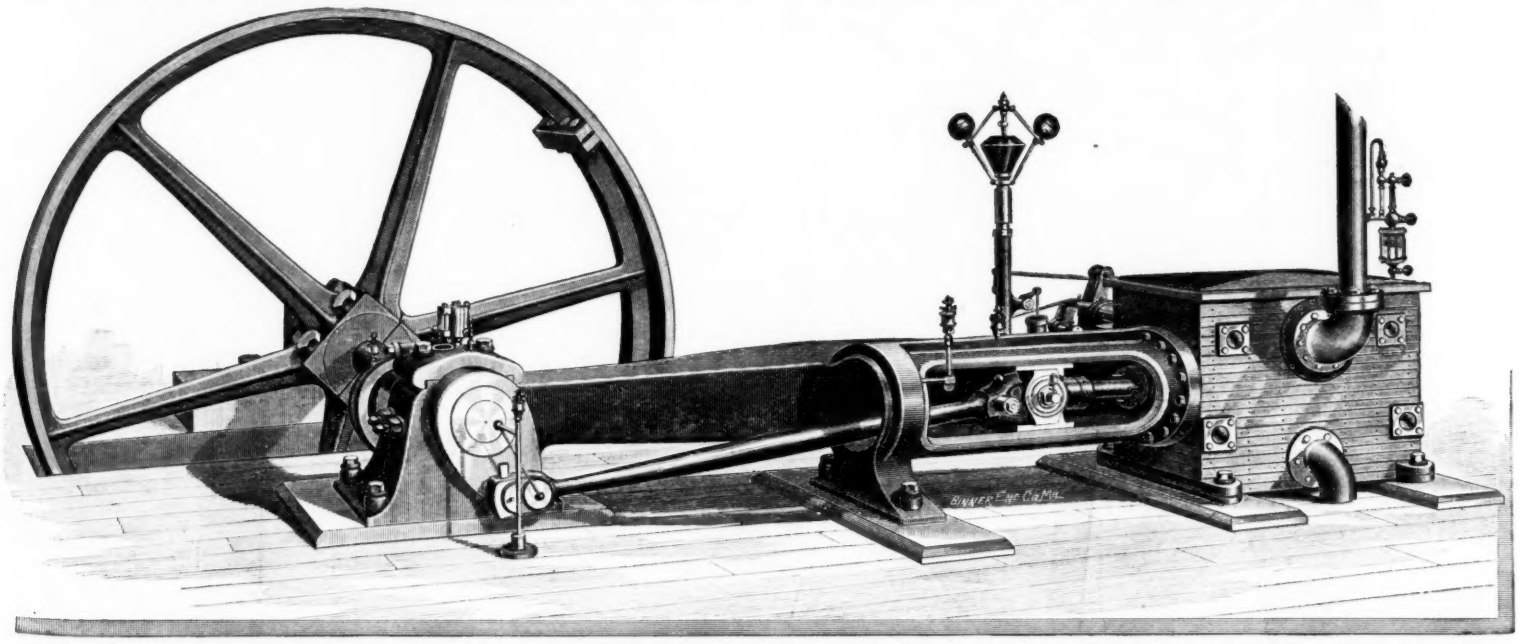
The manufacturers, the I. & E. Greenwald Co., 248 East Pearl street, Cincinnati, O., make a specialty of this engine, and will give further information

THE NORDBERG CORLISS ENGINE.

We illustrate herewith a new Corliss engine, which possesses a number of valuable features distinguishing it from any other now built. It is designed by Mr. Bruno Nordberg, who is well known as a steam engineer of marked ability. It is calculated to meet the increasing demand for greater strength and rigidity and durability of wearing parts.

The frame is of the girder pattern, cast in one piece with the main bearing and slide. It is box shaped and hollow, the iron being distributed where needed to resist the strain brought upon the frame by the operation of the engine, and to secure perfect rigidity and alignment under all circumstances. The foot under the main bearing is considerably wider than the length of the bearing, and is provided for four foundation bolts. The slides are tied together at front end by a cast ring which is an integral part of the frame. The lower side of the frame forms a foot which is bolted to the foundation. In designing the cylinder, which is patented, the object kept in view was to increase the inlet valve area and at the same time reduce the clearance.

Corliss engines of the larger sizes have always been supplied with steam ports too small in proportion to their speed, partly because a large port area requires a valve of large diameter, and partly because it increases the clearance. Both of these objections are obviated in the Nordberg Corliss engine. The inlet valve area in all sizes of engines is proportionate to the speed, or, in other words, the velocity of the steam is the same in all sizes of engines. At the same time the diameter of the inlet valves is not more, and is in some cases less, than in the same sized engines of other manufacture. The clearance in the valve cavities is a great deal less than in those commonly made. That of the exhaust valve is reduced nearly one-half, this result being obtained by its location and peculiar construction. The external valve gear presents a great many radical improvements. It is operated by an eccentric on the engine shaft, communicating the motion through a carrier arm and hook rod to a main or wrist lever, from which the motion is transmitted to



THE NORDBERG CORLISS ENGINE.

the four valves. In this respect it resembles the original Corliss valve gear. The main or wrist lever is, however, located in a different relative position to the valves, and is of such a proportion as to give a very quick movement at the point of opening of a valve, whether steam or exhaust; and this is accomplished with considerably less lap on the steam valves than is usually given them. The result of this movement is that less angular advance is needed on the eccectric than when the steam valves have to be set with more lap and the range of cut-off is increased.

Another feature of the Nordberg Corliss valve motion is that the setting of the valves can be adjusted without changing the length of the valve rods, that is, without disturbing the motion by changing the angles through which the valves are intended to move; this advantage, we believe, will be appreciated by engineers familiar with Corliss engines. The bearings on all valves and levers are much larger than on any existing engine. The exhaust arms are supported in the bonnets, relieving the valve stems from transverse strain. The inlet valve and trip mechanism is of an entirely different type. The first motion, or steam levers, mounted on the bonnets and carrying the catches, receive their motion from the wrist lever. The catches engage with steel-faced projections on the dog levers, which are keyed on the valve stems and also connected to the vacuum dash pots.

The design is such as to bring all these parts in one line. All the working bearings about the steam valve gear are made double, and the hardened steel plates have twice the usual width. The catches are released by cams mounted on the bonnets, outside the rest of the valve motion where their lubrication is not affected by the heat, but little force is required to release the catches. The construction of this valve gear is such as to permit the addition of a full stock cut-off at slight additional expense. The value of this attachment on engines that at times have extra duty to perform, can not be over estimated. The end play on the inlet valve stems is adjusted by set screws at the ends of the bonnets. The dash pots are of an improved type, calculated to shut the valves as quick as possible. Their action is practically noiseless. They are pivoted on the exhaust bonnets and can never get out of line. The cross-head is of a very compact pattern, and is fitted with adjustable shoes lined with genuine babbitt metal, hammered in and turned to fit the slide. The area of the shoe is very large, being about one-half of the piston area. The cross-head pin is secured with taper fit, and can easily be removed. The connecting rod is recently patented, being entirely new. Both ends are solid and provided with most secure and convenient devices for adjusting the boxes. The crank pin boxes are brass, lined with genuine babbitt metal. The cross-head pin boxes are made of hard phosphor bronze. All pins and piston rod are of steel of the best quality. This engine possesses a number of other peculiar features which cannot be here described. It is built throughout of the best material and workmanship.

The Wilkin Manufacturing Co., of Milwaukee, Wis., are the sole manufacturerers of the Nordberg Corliss engines, and will cheerfully answer all inquiries pertaining to them. They are prepared to furnish them of all sizes up to 2,000 horse power, single, compound and triple expansion, and with or without jet or surface condensers; also to plan and construct complete power plants.

Overdone Lines of Manufacture.

It is remarkable what a fascination certain lines of business possess which are manifestly overdone. The stove trade, the nail trade, the bar iron trade and quite a number of other branches of the iron business cannot now support all or even nearly all the manufacturing establishments erected in their lines, and yet others are constantly being added. Reference is not made here to works which are being erected in parts of the country not previously supplied with them, but to the additions which are constantly being made to the productive capacity of old manufacturing localities. It is probably better to engage in manufacturing staple goods than to turn out something of an ephemeral character or which will only have a temporary sale. But it is unfortunate for those in the trade, as well as for the newcomers themselves, that so little attention appears to be paid to the question of marketing product. The stove trade seems to offer an opportunity for a man of cultivated taste combined with good business qualifications. But even there he will find an overwhelming array of competitors blessed with just such qualifications and probably in greater degree than himself. Expansion of manufacturing facilities in staple lines is one of the serious conditions of the time, and for which there seems to be no remedy.—[Metal Worker.

Implements in India.

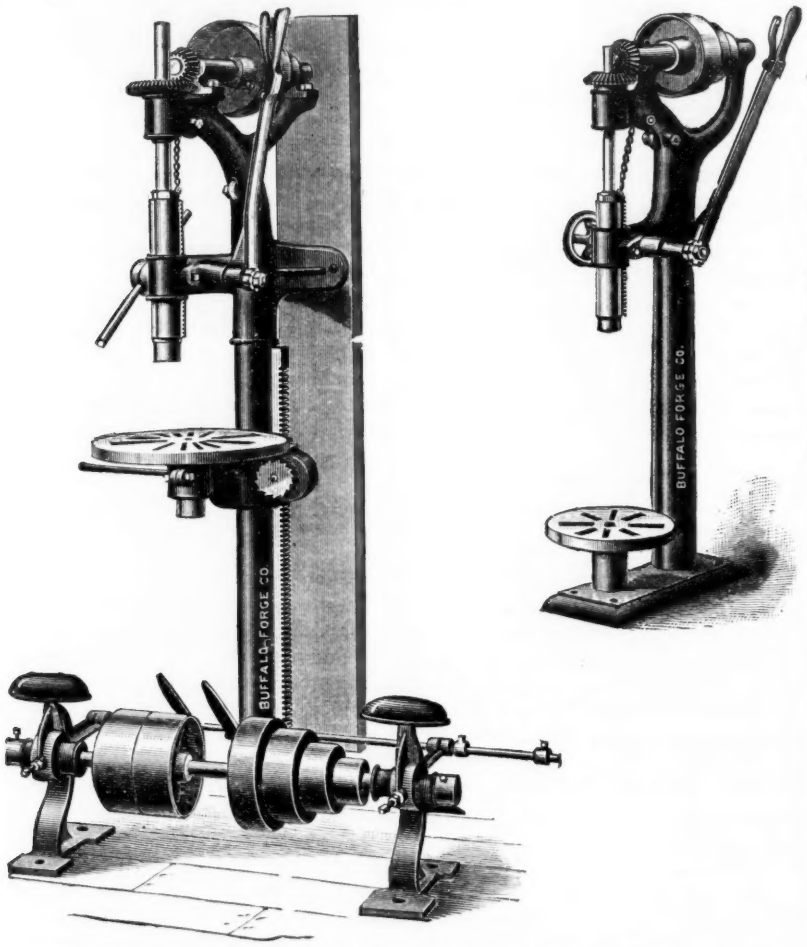
The British official report of the tests of agricultural implements and introductory efforts, made during 1888-89, in India, under the auspices of the government, for the purpose of promoting the use of improved machines and methods by the natives, shows that progress and favorable results have followed. Quite a variety of modern plows have been successfully introduced, and the sales of some kinds are now considerable. Winnowing and grain cleaning machines are very favorably received and used with satisfaction. Chaff cutters with bullock power were operated successfully by the natives and will find customers. Grain kibbling mills meet an increasing demand and seem to be quite extensively used. A considerable trade has been established in hoes, harrows, grubbers, etc., and also in water-lifts and pumps of various kinds. Of sugar mills, cane crushers and evaporators there is some variety; they are largely used in sections where required, and their use is said to be extending rapidly. During the past few years the government has been endeavoring to enlighten the natives and accustom them to improved methods by giving public trials and by putting implements on their farms with experts to instruct them, etc. The results are satisfactory.

Of the 96 establishments using natural gas in 1887, 57 were situated in Pittsburgh or its vicinity, 15 were in the western district of Pennsylvania, 7 were in West Virginia, and 17 were in Ohio. The notable saving and improvement which have come from the new fuel, and the active impulse thus given to the manufacture of iron and steel, have been confined to the bituminous coal region, as natural gas has not been discovered in the vicinity of the great deposits of anthracite coal.

IMPROVED UPRIGHT POWER DRILLS.

The drills illustrated by the accompany engravings represent two of a large line of drilling machines for various uses made by the Buffalo Forge Co., Buffalo, N. Y. Both designs have machine cut gears, running perfectly noiseless, the spindles taking a ¾-inch Morse taper shank, and will drill up to a 1¼ inch hole. The larger drill No. 37 will drill to a center of 20-inch circle, a special attachment for carrying wheels when drilling the tire is afforded for the No. 87 drill, which is especially adapted and designed for the work of carriage and wagon makers, which features is much appreciated by users of this kind of drill, as it greatly facilitates the work. This machine is arranged for four changes of speed, and is provided with adjustable table for raising and lowering to meet the demands of different classes of work, weighs 320 lbs., and is 66 inches in height.

The smaller No. 83 will drill to a center of 11-inch circle, having three changes of speed, is 50 inches high and weighs 150 lbs. The new design of



countershaft shown with No. 87 is adapted for tight or loose pulleys, and is made in suitable sizes for the smaller power drills. The bearings, which are of the ratio of 4 to 1 are solid, not babbitted, and bored out and reamed to gauges of cast iron, which increases their lasting qualities. It is also provided with hanger and shipper arm all of one piece, which is a great convenience in putting up the hanger. The length of countershaft is 32 inches, diameter of pulley 8 inches and should be run at 250 revolutions per minute. All working parts of these drills are made of best material from accurately fitted templates.

THE FUEL OF THE FUTURE.

Prof. N. S. Shaler has a very interesting article in the *Arena* for May, on "The Fuel of the Future." He takes the position that what is popularly termed natural gas is destined to speedy exhaustion, but he thinks its effect on the economic methods of our civilization are certain to be enduring; and that the superior cleanliness and convenience of gas as a fuel will bring the world to the use of manufactured gas for fuel purposes when the supply of natural gas has given out, and in those localities where geological formation is such that the discovery of natural gas cannot be hoped for. The professor says:

"Though the natural combustible gases are destined to speedy exhaustion their effects on the economic methods of our civilization are certain to be enduring. The use of this new fuel has accustomed the public to a better way of bringing burnable material to the factories and dwellings than has been pursued since the dawn of civilization. It will certainly be a matter of surprise to the future historian of the economic science of our day that we have so long persisted in the practice of bringing crude fuel to our furnaces and domestic fireplaces, and have patiently endured the trials which smoke, dust and ashes have imposed upon us. It is not to be expected that any of the thrifty cities which have enjoyed the advantages of rock gas will be willing to return to the ruder processes of firing which they have so long abandoned. Nor is it likely that other rival towns will be content to accept the deprivation of this good which their geologic condition impose upon them, provided any economic method whereby artificial gas may befurnished them can be devised.

"The invention of water gas seems to provide an art by which we may hope to supply a vaporous fuel at a cost which will little exceed the average in tax laid upon consumers by the companies which pipe the rock gas to many of the Western towns. This form of fuel is produced by passing steam through, large vessels containing incandescent carbon in the form of coke or anthracite coal, and the result is a mixture principally composed of one atom of carbon and one of oxygen, known as carbonic oxide, together with hydrogen. The water of the steam is, in fact, decomposed, the oxygen combining with the carbon, and the hydrodgen remaining uncombined.

"When burnt at the point of use, the carbonic oxide (CO) takes up from the air another atom of oxygen, forming carbonic dyoxide (CO_2) and the hydrogen also combines with oxygen forming water. These processes give rise to the evolution of a great heat. By enriching the gas with vapor of petroleum or other hydrocarbons, the material may be made to afford an excellent light. Although only $\frac{1}{14}$ of the weight of water gas is hydrogen, this element is extremely valuable in giving heat to the flame, for it yields caloric in burning in larger share than any other known substance."

The Professor thinks that "it will be a matter of surprise to the historian of the economic science of our day that we have so long persisted in bringing crude fuel to our furnaces and domestic fire-places, and have patiently endured the trials which smoke, dust and ashes have imposed upon us." A very general belief among all advanced thinkers who have given time to the subject.—[Modern Light & Heat.

English Agricultural Machinery and the New South.

It is said that the few English-made agricultural instruments which find their way to the United States are, almost without exception, for the market in the Southern States, and the fact is accounted for by the conservative tendencies of the South. In the old slavery days there was a very close touch between the South and ourselves. Rather than send to New England for his tools and machinery, the planter would suffer almost any degree of delay and inconvenience to get them from Old England. A few gentlemen of the old *regime* survive the changes of twenty-five years, and have kept some portions of their plantations from the spoiler. These are our American customers for implements, and we have little doubt that they prefer to have the good old styles of tools, if they can get them, to any new-fangled improvements, however meritorious. The new South is very differently constituted, and the best and costliest hardware is finding every year a steadily improving market in that section. The new blood has no ancient prejudices.—[Ironmongery (London).

Strikes in Russia and the United States.

In Russia, it is said, the man who leads a strike is spirited away and shipped to Siberia.—[Iron Trade Review.

In no country of continental Europe has the workman much better treatment than the Russian plan. The armies are always at the beck and nod of the authorities who represent the capitalistic and aristocratic classes. In Great Britain the workingmen have more freedom than elsewhere, and in this we can hardly make the United States an exception. America has its cunning in politics to overcome the betterment of labor under the demagogue guise of compliance with the demands of the workers, while it has, too, the "Pinkerton detectives," an unauthorized armed body that not even a continental European power would permit to be employed.—[National Labor Tribune.

Machinery in Austria-Hungary.

There should soon be a better opening than there has been for machinery and implements in Austria-Hungary. In the lower house of the Hungarian diet the minister of agriculture has declared that the government was willing to promote by every means in its power the formation of agricultural associations, and was at present considering the question of granting advances to be devoted exclusively to the extension of vineyards. The government was certainly in a position to provide the sums required for this purpose. The minister of finance stated that he was opposed to commercial syndicates generally, and that the government could neither support nor promote them. State iron works, if not joining syndicates, would not be able to carry on business even at a small profit.—[Farm Implement News.

Metal Furniture in Australia.

Singularly enough, a cry for metal furniture is being raised in Australia, and our descendants may, at some future date, trace back a universal use of metal for house furniture to the plague of the white ant in Queensland. These pests, we are told by a visitor recently returned fron that colony, honeycomb not only the wood-work of the dwellings, but the tables, chairs, stands and wood furniture generally. Necessity may thus establish a new industry, and fashion may follow on the heels of necessity till, as we have suggested, the worker in metal shall eclipse the cabinet-maker. It is stated that an effort has been made to obtain school desks and seats in light metal both in England and America, but in vain. If the need is real, however, a large order of the kind is not likely to go long a-begging.—[Ironmongery (London).

SMOKE-CONSUMING apparatus has been adopted by the Corporation of Leeds, England, in connection with two boilers for the public refuse destructors. The chief feature of this new apparatus is, that the furnace is so constructed as to burn in a downward direction. Ordinary fire-bars are dispensed with altogether. By means of a descending draught, the smoke, thoroughly saturated with oxygen, is passed through the mass of incandescent flame, the hydro-carbon gas being thereby burnt and destroyed, and the flame converted into carbonic acid gas before it enters the flue. A general application of this invention would, it is claimed, solve the problem of the smoke nuisance in large towns.

THE longest railroad bridge span in the United States is the cantilever span in the Poughkeepsie bridge over the Hudson river, 548 feet.

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INDUSTRIAL SUMMARY.

New Enterprises:—

Frank Hornish, inventor of the Hornish boiler cleaner, will erect a steam plant, in the near future, at Peoria, Ill.

The St. Paul Fence Works Co. has filed articles of incorporation with the Secretary of State. The capital stock is placed at $10,000. The incorporators are Oliver J. Clark, Gustav Nelson and Kate Wilson.

A contract has been closed with the Railroad & Improvement Co., of Florence, Ala., to locate a large foundry for the manufacture of stone fronts, architectural iron castings, etc., at that place. The plant will cost $100,000.

Maxwell & Vincent have secured three acres of land in the eastern suburbs of Springfield, O, and will cover about half of it with buildings for carrying on the steel casting business, using the crucible process. They intend to be making castings before the middle of June.

Articles of incorporation have been filed in New Jersey by the Coale Muffler & Safety Valve Co., to manufacture machinery used in the construction of locomotives and stationary and marine engines. The capital stock is $300,000. The incorporators are Joseph M. Coale, W. J. O'Brien, Charles J. Cary and Frank M. Coale, of Baltimore, and Samuel C. Childs, of Camden.

Articles of incorporation have been filed with the Secretary of State by the New York Superheating Co., with offices in New York and Jersey City. The incorporators are James Gibbon, of Jersey City; C. M. Bomeister, of New York; Frederick Girken, of New York, and George Noakes, of New York. The capital stock is $250,000. The company is organized for the manufacture and sale of stoves, furnaces, grates and other heating and lighting apparatus, and especially for the manufacture of apparatus for the generation of heat known as "Gibbon's superheating process."

Recent Illinois incorporations: Elgin Light & Power Co., Elgin; capital, $1,000,000; incorporators, C. Towner, William Fay, E. Hagelow.—Monitor Manufacturing Co., Chicago, to manufacture farm machinery; capital, $100,000; incorporators, H. M. Pettingill, J. H. Haskell, Thomas Cratty and others.—Western Railway Appliance Co., Chicago, to manufacture patented railway appliances; incorporators, C. A. Schroyer, J. M. Whitman and F. O. Cordo.—Greenlee Foundry Co., Chicago, to do a foundry business; capital, $100,000; incorporators, R. S. Greenlee, R. L. Greenlee and E. W. Russell.—Greenlee Bros. & Co., Chicago, to manufacture wood-turning machinery; capital, $300,000; same incorporators.

A Muskegon (Mich.) telegram says that facts have just come to light relative to the consummation of a deal that will add ten manufactories at one stroke to the manufacturing interests of the city of Muskegon and 10,000 persons to its population. A syndicate of citizens quietly bought about 700 acres of land lying immediately adjacent to the finest portion of the city, and contracted with ten manufacturing concerns to come here. When all was in readiness, they called together a number of the leading capitalists and explained the whole project, which met with unqualified approval. The plan is to sell every lot in the addition, the proceeds, $300,000, minus the cost of the land, to go into a fund to subsidize the manufacturing concerns, ample sites for these being first reserved from the land. The factories under contract to move to Muskegon represent a capital of $1,500,000, and the erection of their buildings will begin immediately. The factories will be in operation some time this Summer and will at first employ 1,000 men.

Enlargements, Additions, Removals, Etc.:—

The East Tennessee, Virginia & Georgia is building shops and roundhouses at Knoxville, Tenn., which will cost, when completed, $600,000.

The West Superior Iron & Steel Co., of West Superior, Wis., propose to build a Bessemer works and a rolling mill for steel plates, beams and structural shapes.

A meeting of creditors of the Iron Car Co., whose claims aggregated about $600,000, was held in New York, May 12, and steps were taken to reorganize the company.

The Buffalo Steam Forge, of Buffalo, N. Y., has leased the Cayuta Forge & Axle Co.'s works, at Sayre, Pa. This action was necessary on account of the recent large orders for car and locomotive axles.

Wm. B. Pollock & Co., proprietors of the Mahoning Boiler Works, at Youngstown, Ohio, have just completed the erection of an addition to their plant measuring 60x140 feet. It is fitted up with a 10-ton crane and a new riveting machine with a 10-foot gap built by the Wm. Sellers Co., incorporated, of Philadelphia. The firm have also added a new 15-ton steam hoist and a new set of rolls. They are now prepared to turn out heavier work than heretofore.

The Link Belt Machinery Co., Chicago, Ill., is building a machine shop, 125x400 feet, and three stories high They will use an electric traveling crane, and the shop will be lighted with electric lights.

Emil Zeis, proprietor of the Globe Iron Works, St. Louis, Mo, has purchased a manufacturing site, with a frontage of 258 feet. He will build thereon the coming Fall a much larger works than he is now operating.

General Industrial Notes:—

The Buckeye Engine Co., Salem, O., manufacturers of self-contained automatic cut-off engines, etc., whose Chicago office was at 154 Washington street, has removed to 97 Washington street, room 20.

W. J. Burton & Co., Detroit, Mich, mauufacturers of the celebrated "Eastlake" metallic shingles for roofing and siding, are presenting their patrons and friends with a neat vest-pocket memorandum book and calendar, containing many testimonials as to the durability and excellence of the shingles, besides over forty blank pages. The book must be seen to be appreciated.

Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 P. M., on the 6th day of June, 1890, for all the labor and material required to fix in place complete the low-pressure, return-circulation steam heating and ventilating apparatus, and power boiler with connections, for the U. S. Postoffice, Court House, etc., building at Wichita, Kan.

The Queen City Spring Co., Cincinnati, O., have completed their new building, extending now from Culvert street through to Eggleston avenue, doubling their capacity, and with the increased facilities, they can now fill all orders promptly. Mr. Wm. Harty, known throughout the land as a thorough and practical spring man, is the superintendent, which is a guarantee that they turn out only first class work.

The Seaton Manufacturing Co., Cleveland, O., manufacturers of bolt headers, rivet machines, upsetters, etc., have just issued their second annual catalogue. During the past year they have brought out some new machines adapted to special work. Special pains are taken in the building of all their machines, and nothing but first-class material used. All information will be cheerfully furnished, or even a special call made if necessary.

The Springfield Emery Wheel Manufacturing Co., Bridgeport, Conn., patentees and manufacturers of emery wheel machinery, emery wheels, sapphire paper and polishers' supplies, announce that they have removed their entire plant from Springfield, Mass., to Bridgeport, Conn., and are now installed in new factories, designed especially for their business, on Howard avenue and Spruce street. New machinery and the latest appliances have been added, thus affording them excellent facilities for turning out strictly first-class goods, and to meet the constantly increasing demand for their line of goods.

J. Wendell Cole, manager Detroit (Mich.) Emery Wheel Co., writes us as follows: "Messrs. Wm. Sellers & Co., Philadelphia, Pa., write me that they have, since last writing, received orders for five of their special tool grinders, as follows: from Fried Krupp, Essen, Prussia; P. H. Roux & Cie, Paris, for one of the French railways; Schenectady Locomotive Works, New York; Link Belt Engineering Co., Nicetown, Pa. and Otis Bros & Co., Yonkers, N. Y. The fact that, in order to secure the best results from machine tools and men using them, you must have the steel cutting point of the best shape and design and ground to the best working angles, is one that employers are now becoming more forcibly aware of than ever before. There is but one best shape for a tool. Why not duplicate that best shape accurately in all other tools of the class?

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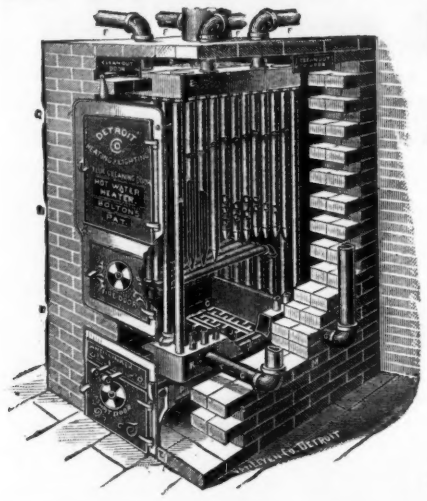

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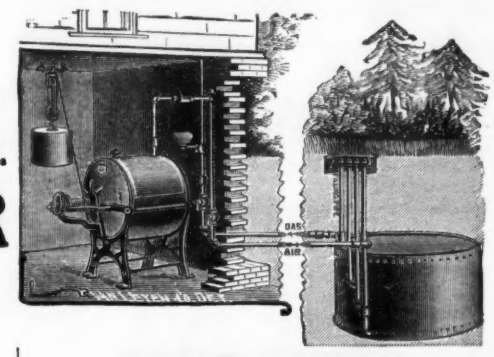

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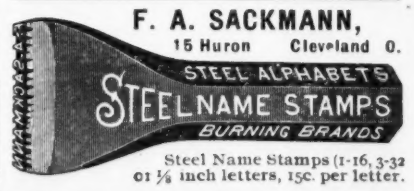

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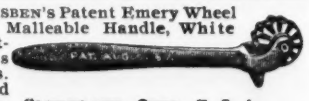

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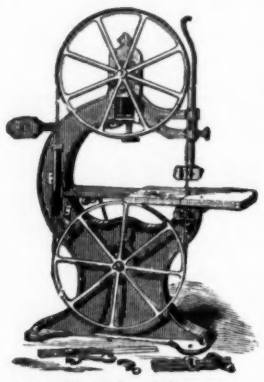

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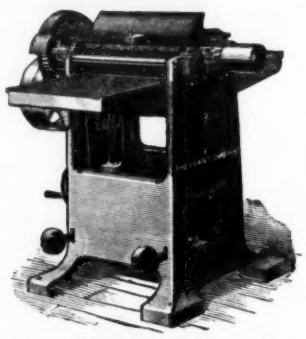

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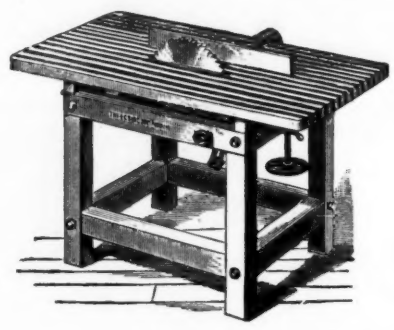

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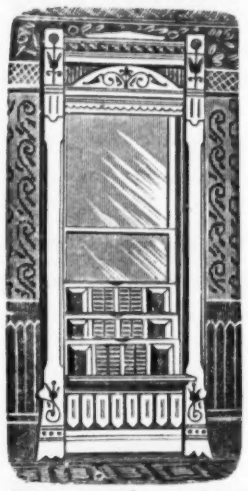

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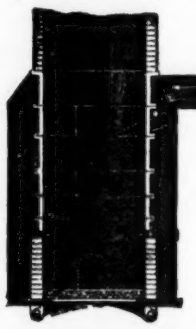

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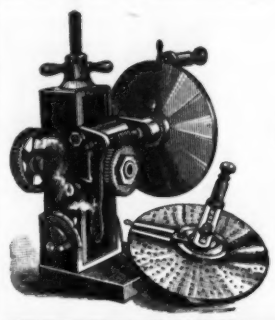

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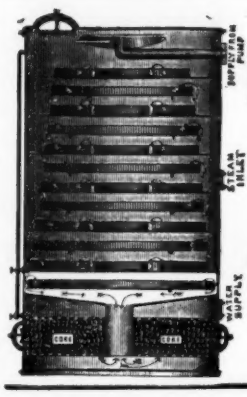

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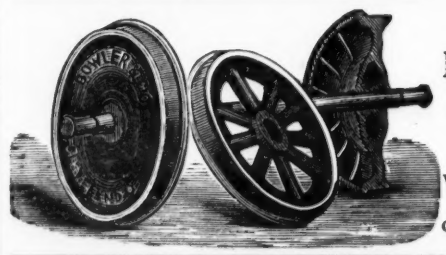

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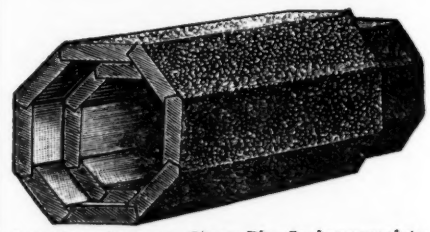

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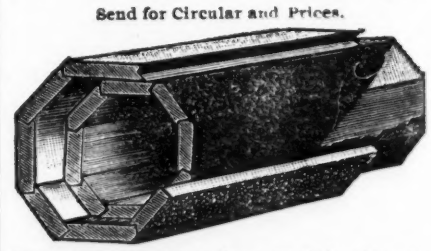

Two staves removed to show the lining between the inside and outside staves.

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CINCINNATI, O. U.S.A.

Steam Jet Pumps,	-	**From $4.00 up.**
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Blooms and Billets, Steel Angles, Forgings, Bar and Spring Steel, Steel Street Rails, Steel O Barrel Hoops, Wire of all Kinds, Iron and Steel Boiler Plates, Galvanized and Black Sheet Iron, Corrugated Iron Roofing, Sheet Steel.

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CHICAGO (reported by Messrs. Rogers, Brown & Co.): Southern Coke No. 1. Foundry, $16 00 @16 50; Southern Coke No. 2 Foundry, $15 50 @16 00; Southern Coke No. 3 Foundry, $15 00 @15 50; Southern Coke No 1, Softeners, $15 50 @16 00; Southern Coke No. 2, Softeners, $15 00 @15 50; Ohio Silveries No. 1, $18 25@1875; Ohio Silveries No. 2, $17 25@ 18 75; Ohio Strong Softeners No. 1, $19 25@19 75; Ohio Strong Softeners No. 2, $18 25@18 75; Lake Superior Charcoal Nos. 1 to 6, $20 50@21 50; Tennessee Charcoal No. 1, $20 00@20 50; Tennessee Charcoal No. 2, $19 50@20 00; Southern Standard Car Wheel, $24 50@25 00; Tennessee Standard Car Wheel, $20 50@21 00; Hanging Rock Standard Car Wheel Cold Blast, $26 00@28 00; Hanging Rock Standard Car Wheel Warm Blast, $23 00@25 00; Old Car Wheels, $00 00@00 00.

LOUISVILLE (reported by Geo. H. Hull & Co.): Southern Coke No. 1 Foundry (new classification), $14 50@14 75; Southern Coke No. 2 Foundry (new classification), $14 00@ 14 25; Southern Coke No. 3 Foundry (new classification), $13 50@13 75; Grey Forge, $13 00@13 25; White and Mottled, different grades, $12 25@12 50; Silver Grey, different grades, $13 00@14 00; Southern Charcoal No. 1 Foundry, $17 00@18 00; Southern Charcoal No. 1 Mill, $15 75@16 75; Southern Car Wheel, Standard brands, $22 50@23 00; Southern Car Wheel, other brands, $18 50@21 00; Hanging Rock Coke No. 1 Foundry, $00 00@ 0) 00; Hanging Rock Charcoal No. 1 Foundry, $00 0)@ 00 00; Hanging Rock Cold Blast, $00 00@00 00; Hanging Rock Warm Blast, $00 00@00 00.

LOUISVILLE (reported by Hall Bros. & Co.): HOT BLAST FOUNDRY—Southern coke No. 1, $14 75@15 00; Southern coke No. 2, $14 00@14 50; Southern coke No. 3, $13 50@13 75; Mahoning Valley (Lake ore mixtures), $17 50@18 50; Southern charcoal, No. 1, $17 00@17 50; Southern charcoal, No. 2, $16 50@17 00; Missouri charcoal, No. 1, $18 00@18 50; Missouri charcoal, No. 2, $17 00@17 50. FORGE—Neutral coke, $13 00@13 50; Cold short, $13 00@13 25; Mottled, $12 00@12 50. CAR WHEEL AND MALLEABLE—Southern (standard brands), $22 00@ 23 00; Southern (other brands), $18 00@19 00; Lake Superior, $22 50@23 00.

ST. LOUIS (reported by Rogers, Meacham & Shields): HOT BLAST COKE AND CHARCOAL—Southern Coke No. 1, $15 75@16 25; Southern Coke No. 2, $14 75@15 25; Southern Coke No. 3, $14 25@14 75; Southern Grey Forge, $13 75@ 14 25; Southern Charcoal No. 1, $18 00@18 50; Southern Charcoal No. 2, $17 50@18 00; Missouri Charcoal No. 1, $18 00@18 50; Missouri Charcoal No. 2, $17 50@18 00; Ohio Softeners, $18 50@ 20 00. CAR WHEEL AND MALLEABLE IRONS—Lake Superior, $22 00@23 00; Southern, $ 9 00@ 23 00. CONNELLSVILLE COKE—East St. Louis, $5 65; St. Louis, $5 80.

BUFFALO (reported by Rogers, Brown & Co.): Mahoning and Shenango Valley strong, No. 1 Foundry, $19 00@00 00; Mahoning and Shenango Valley strong, No. 2 Foundry, $18 00 @0 00; Niagara No. 1, $19 25@00 00; Niagara No. 2, $18 25@00 00; Niagara No. 3, $17 25@00 00; Ohio Softener No. 1, $18 50@00 00; Ohio Softener No. 2, $17 50@00 00; Lake Superior Charcoal, $22 00@00 00; Tennessee Charcoal, $20 50@00 00; Southern Softener No. 1, $16 75@00 00; Southern Softener No. 2, $16 00@00 00; Southern Strong No. 1 Foundry, $17 75@00 00; Southern Strong No. 2 Foundry, $16 75@00 00; Alabama Car Wheel, $25 00@00 00; Hanging Rock Charcoal, $24 00@00 00.

DETROIT (reported by William F. Jarvis & Co.): Lake Superior Charcoal, all Numbers, $21 00@21 50; Lake Superior (coke) Bessemer, $18 00@ 9 00; Katahdin (Maine charcoal), $24 50 @25 00; Lake Superior Coke, Foundry, all ore, $18 75@19 25; Lake Superior Coke, Foundry Cinder Mixed, $18 00@19 00; Standard Ohio Black Band, $18 75@19 25; Southern No. 1, $16 50@17 00; Southern Gray Forge, $14 75@ 15 25; Jackson County (Ohio) Silvery, $18 75@ 19 25; Old Car Wheel, $20 00@00 00.

PITTSBURGH (reported by A. H. Childs): No. 1 Foundry, $17 00@17 50; No. 2 Foundry, $16 00@16 50; Grey Forge, $15 00@15 50; White and Mottled, $14 25@14 50; Warm Blast Charcoal, $19 00@22 00; Cold Blast Charcoal $23 00 @29 00; Bessemer, $18 00@18 50.

CINCINNATI (reported by Rogers, Brown & Co.): FOUNDRY IRONS—Southern Coke, No. 1 foundry, $15 00@15 50; Hanging Rock Coke, No. 1 foundry, $17 50@18 50; Jackson Co. Stone Coal, No. 1 foundry, $17 00@17 50; Tennessee Charcoal, No. 1 foundry, $18 00@18 50; Hanging Rock Charcoal, No. 1 foundry, $21 00 @22 00. MILL IRONS—Standard Southern Coke, grey forge, $13 25@13 75; Standard Southern Coke, mottled $12 50@13 25; Co'd Short Southern Coke, grey forge, $12 00@13 50; Strong Ohio Neutral Coke, grey forge, $15 50@16 00. CAR WHEEL AND MALLEABLE—Standard Alabama Car Wheel, $22 50@23 00; Tennessee Car Wheel, $20 50@21 50; Lake Superior Car Wheel, $22 00@23 00.

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Flat Bar.

1½ to 4 by ⅜ to 1 inch	1 85
4¼ to 6 by ⅜ to 1 inch	1 95
1¾ to 6 by 1¼ to 2 inch	2 25
1¼ & 1⅜ by ⅜ to ¼ inch	1 95
1 & 1¼ by ⅜ to ¼ inch	2 05
⅝, ¾ and ⅞ by ⅜ to ⅝ inch	2 25

Round and Square.

1 to 1⅞ inch	1 85
2 to 2⅜ inch	2 05
2¾ to 3¼ inch	2 35
3⅜ to 4 inch	2 85
4¼ to 4½ inch	3 35
4¾ to 5 inch	3 55

Oval.

⅜ to 1¼ inch	2 25
⅜ to ¾ inch	2 45
½	2 65
⅝	3 05

Half Oval and Half Round.

1½ to 3 inch	2 95
⅜ to 1¼ inch	2 55
⅜ to ¾ inch	3 15
½	3 35
⅝	4 85

Heavy Band.

1¼ to 6 by ¼ and 5-16 inch	2 05
1 to 1¼ by ¼ and 5-16 inch	2 15
¾ to ⅞ by ¼ and 5-16 inch	2 35
½ to ¾ by ¼ and 5-16 inch	2 85

Hoops.

1¼ to 4, Nos. 13 to 15	2 65
1¼ to 2, Nos. 16 to 18	2 75
1¼ to 2, No. 19	2 85
1¼ to 2, No. 20	2 95
1¼ to 2, No. 21	3 05
1¼ to 2, No. 22	3 15
15-16, 1 and 1⅛, Nos. 13 to 15	2 85
15-16, 1 and 1⅛, Nos. 16 to 18	2 95
15-16, 1 and 1⅛, Nos. 19 and 20	3 05
15-16, 1 and 1⅛, No. 21	3 15
15-16, 1 and 1⅛, No. 22	3 25
⅞, Nos. 13 to 15	3 05
⅞, Nos. 16 to 18	3 15
⅞, Nos. 19 and 20	3 25
⅞, No. 21	3 35
⅞, No. 22	3 45
13-16, Nos. 13 to 15	3 25
13-16, Nos. 16 to 18	3 35
13-16, Nos. 19 and 20	3 45
13-16, No. 21	3 55
13-16, No. 22	3 65
¾, Nos. 13 to 15	3 35
¾, Nos. 16 to 18	3 55
¾, Nos. 19 and 20	3 65
¾, No. 21	3 75
¾, No. 22	3 85
11-16, Nos. 13 to 15	3 55
11-16, Nos. 16 to 18	3 75
11-16, Nos. 19 and 20	3 85
11-16, No. 21	3 95
11-16, No. 22	4 05
⅝, Nos. 13 to 15	3 85
⅝, Nos. 16 to 18	4 05
⅝, Nos. 19 and 20	4 15
⅝, No. 21	4 25
⅝, No. 22	4 35
⅝, No. 23	4 55

Light Band.

1¼ to 6 by ⅛ to 3-16 in	2 25
1¼ to 6 by Nos. 11 and 12	2 35
1 to 1⅜ by ⅛ to 3-16 in	2 45
1 to 1⅜ by Nos. 11 and 12	2 55
⅞ and 13-16 by ⅛ to 3-16 in	2 75
⅞ and 13-16 by Nos. 11 and 12	2 85
¾ and 11-16 by ⅛ to 3-16 in	3 05
¾ and 11-16 by Nos. 11 and 12	3 15
⅝ and 9-16 by ⅛ to 3-16 in	3 35
⅝ and 9-16 by Nos. 11 and 12	3 45
½ by ⅞ to 3-16 in	3 65
½ by Nos. 11 and 12	3 75

Wagon Box Iron.

⅜ inch, beveled edge, by Nos. 11 and 12	2 85
⅜ inch, " " " 13 and 14	3 05
¼ inch, " " " 11 and 12	3 15
¼ inch, " " " 13 and 14	3 35

Sheet Iron.

No. 10 to 14	2 65
No. 15 to 17	2 80
No. 18 to 21	3 00
No. 22 to 24	3 20
No. 25 to 26	3 35
No. 27	3 45
No. 28	3 55

Iron Boiler Plates.

Tank, ¼ inch and heavier	2 80
C No. 1, " "	3 05
C H No. 1 " "	3 30
C H Flange, " "	4 05
Extra Flange, "	4 55
Solid Fire Box "	5 30

Steel Boiler Plates—1-4 in. and Heavier.

Tank	3 00
Shell	3 40
Flange	3 70
Marine Flange	4 10
Fire Box	4 80

Above includes plates 90 inches wide.

90 to 96 in. wide	¼c ℔ extra
96 to 100 in. wide	1 c "
100 to 104 in. wide	1¼c "
104 to 116 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. ℔s
1 to 2 in. inclusive	09
9-16 to ½ in "	09
7-16 to ⅜ and 2⅜ to 3 in	10½
3⅛ to 4 in	11
⅝ to 11-16 and 4⅛	10½
⅛ to 6 in	11½
¼ to 9-32 and 6⅛ to 7 in	12
3-6 in	14

Flats.

	cts. ℔s
2 to 9-16 wide by 2 to ¾ thick	0

Bessemer and O. H. Steel.

Machinery	base price,	3 00
Tire	"	3 00
Spring	"	3 50
Sleigh Shoe	"	3 00
Toe Calk	"	3 25
Cutter Shoes, tapered and burr.	"	3 25

English Tool Steel.

Jessop's	16c
Hobson's "Best"	16c
" "Choice"	36c

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	4 00
Bridge ½, ⅝, 11-16 and ¾ inch diam	4 00

SCRAP IRON AND OLD METAL.

	Net Tons
No. 1 R. R. wrought scrap	$18 00
No. 1 wrought scrap	16 50
No. 1 Machine cast scrap	13 00
Iron axles	22 00
Axle turnings	13 50
Wrought turning (free from cast)	12 00
Cast borings	9 00
Uncut wrought iron boilers	13 00
Steel boiler plates	17 00
Grate Bars	9 00
Pipes and flues (Clean)	12 00
Tank iron	12 00
Hoop and band iron	9 00
Sheet iron	10 00
Wrought drillings	11 00
Malleable iron	10 00
	Gross Tons
Old iron T rails	22 50
Old steel rails	19 50
Old car wheels	18 50
Old copper	⅜ ℔ 10
No. 1 H. red Brass	11
Heavy yellow brass	8½
Light yellow brass	6
Scrap Zinc	
Tea Lead	
Heavy Lead	3¼

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RAILROAD AND BOAT SPIKES.
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American.....₩ lb 9@10
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Blacksmiths' { Hill's.....dis 40 / Bullock's.... dis 50&10
Moulders'.....dis 40@40&10
Hand.....dis 40&10@50

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Boston Belting Co's standard.....dis 70@70& 5
" " " extra.....dis 60&5@60&10
" " " best.....dis 55
Hoyt's Short Lap.....dis 45
Cleveland Rubber Co. extra standard.dis 60&10
Shultz Raw Hide Leather Belting, single, ...dis 40
Shultz Raw Hide Leather Belting, double, and Light Double.....dis 40
Standard, oak tanned.....dis 55@60
Alexander Brothers' pure oak tanned. ...dis 45

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B. F. Sturtevant's.....dis 20
Boston Blower Co.,.....dis 35
Buffalo.....dis 35

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.....₩ lb 9¾@10¼

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White .....₩ gross 50
White Crayon.....₩ gross 12@12½ dis 10
Red.....dis 70
Blue.....dis 85

Chucks.

Cushman's 4 Jaw Independent.....dis 45
" Combination.....dis 40
" Geared Scroll.....dis 30
" 2 Jaw Brass Workers.....dis 30
" Drill.....dis 35
Wescott's Scroll Combination.....dis 33⅓
" Independent.....dis 40
" Little Giant Drill.....dis 30
Horton's Universal.....dis 40
" Independent.....dis 45
National Combination.....dis 40
Sweetland " .....dis 40
Skinner " .....dis 40
" Independent.....dis 45
Almond Drill.....dis 20
Morse " .....dis 15
Skinner " .....dis 30

Cutters and Reamers.

Cleveland.....dis 10@15
Pratt & Whitney.....dis 10@15
Standard.....dis 10@15
Brown & Sharpe, Milling Cutters.....dis 15
" " Gear Cutters.....dis 15

Crowbars.

Cast Steel.....₩ lb 4
Iron, steel points.....₩ lb 3½

Drill and Drill Stocks.

Twist drills.....dis 50&10
Morse Taper and Straight shank to 1⅜".....dis 50&10
Morse Taper and Straight shank Larger than 1⅜".....dis 25
Drill Sockets.....dis 25
Standard.....dis 55&5
Cleveland.....dis 55&5

Emery.

	No. 4 to 46 gr.	No. 54 to 150. gr.	Flour, F.	C. FF.
Kegs, ₩ lb	4 c	5 c		2½c
½ kegs ₩ lb	4¼c	5¼c		2¾c
¼ kegs ₩ lb	4½c	5½c		3 c
10 lb cans, 10 in case	6 c	6¾c		5 c
10 lb cans, less than 10	10 c	10 c		7½c

Emery Cloth and Paper.

Barder, Adamson & Co.....dis 45@50
H. H. Barton.....dis 40@45

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Detroit.....dis 55@60
Norton's.....dis 55@60
Grant.....dis 55@60
Union Stone.....dis 60
Sterling.....dis 60
Celluloid.....dis 10&33⅓
Northampton.....dis 55
Crystal.....dis 65@70
Vitrified.....dis 60
Vulcanite.....dis 10&10

Files.

Nicholson.....dis 60&10@60&10&10
" X. F.....dis 25
Kearney & Foot.....dis 60&10@60&10&10
Black Diamond.....dis 60&10@60&10&10
Arcade.....dis 60&10@60&10&10
Disston's.....dis 65@70
Western.....dis 70
Stub's.....dis 25
Grobet's.....dis 30
Reynolds Bros.' Hand Cut.....dis 50

Hammers.

P. S. W.....dis 40
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Heavy hammers and sledges under 5 lbs. 18c over 5 lbs 14c, new list.

Jack Screws.

Illinois Bolt Co. list.....dis 70

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¼	4	3¾	3⅛
Hexagon	15⅝	11⅛	8⅝	6	5¾	5⅛	5
Washers	9	8	7	5	4½	4⅛	4⅛

In lots less than 100 lbs, ₩ lb add ½c., lb boxes add 1c to list.

Nails (wire.)

List July 14, 1887.....dis 70 &10
Standard Penny Nails, ₩ keg card rate { Car lots.....$2.30 / Less than car lots $2.40

Oilers.

Zinc and Tin.....dis 60
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz.....dis 70@10&10

Packing, Steam.

Boston Belting Co.....dis 60
American Packing Hemp.....₩ lb 10@11
Russia Packing " .....₩ lb 14
Italian Packing " .....₩ lb 13@14
Plumbago Piston.....₩ lb 40
Morrison's " .....₩ lb 50
Square Flax " .....₩ lb 50
Sheet Rubber.....₩ lb 12@24
Excelsior Rubber.....₩ [illegible]

Picks.

Railroads, 5 to 6 lbs.....$12 dis 60
" 6 to 7 lbs.....$13 dis 60

Pulleys.

Iron Pulleys, Walker List.....dis 45
Medart Pulleys.....dis 55
Split Wood Pulleys.....dis 55

Rivets.

Iron, Thousand, list November 17, ...dis 50
Iron. Ordinary, Cooper's Block and Carriage list November 17.....dis 50
Copper.....dis 50@50&10

Rope.

Manilla, ½ inch and over.....₩ lb 15¼
Sisal, ½ inch and over .....₩ lb 13¼

Sand Paper.

B. A. & Co.....dis 45@50
H. H. Barton's.....dis 40@45
New England Flint.....dis 40@50
Barton's Garnet.....dis 20

Saws.

Disston's Circular.....dis 45
" Band.....dis 20
" Scroll .....Net
Hack Saw Stubs.....dis 20
" " Eureka.....dis 20
" " Star.....dis 20
Saw Swages Disston's.....dis 20
Atkins' Cicular Saws.....dis 50
" Mill, Mulay and Drag Saws..dis 40&10
" Wood Saws.....dis 40&10
" Silver Steel Diamond Cross-cut Saws.....dis 70c per ft
" Dexter Cross-cuts.....dis 50c "
" Diamond " .....dis 30c "
" Tuttle Tooth Cross-cuts..dis 25c "
" One-man Cross-cuts.....dis 32c "
No. 1 Handles.....dis 23c per pair
No. 6 " .....dis 16c "
Excelsior Saw Tools.....$6 per doz
Perfection " .....$15 "
Detroit Saw Works, Circular.....dis 50
" " " Band.....dis 25
" " " Mulay .....dis 45

Screws.

Wood Screws—List Jan 27, 1889.

Flat head iron.....dis 50
Round head iron.....dis 40
Flat head brass.....dis 45
Round head brass.....dis 35
Square Cap.....dis 65
Hexagon Cap.....dis 60
Set C. H. C. P.....dis 70
Machine, flat head, iron.....dis 65
Machine, round head, iron.....dis 60
Bench and hand—
Lag or coach.....dis 75@75&10
Coach, patent gimlet point.....dis 75

Shovels and Spades.

Ames' list November 1, 1885.....dis 20
Dennis.....dis 5.25
Hussey & Binns, railroad.....dis 8.00

Taps.

Cards, Hand and Nut to 2 in.....dis 50
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " " new list dis 10
Machine Screw Taps.....dis 55
Pipe Taps to 2½ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 50
Pulley Taps.....dis 40

Twine.

	BC.	B.
No. 12, Flax Twine, ¼ and ½ lb Balls	21c@29c	
No. 18 " " ¼ and ½ "	18c@28c	
No. 36 " " ¼ and ½ "	16c@27c	
2-Ply Hemp, ¼ & ½ lb Balls (Spring Twine)	11½c	
3-Ply " 1 lb Balls	12@12½c	
3-Ply " 1½ lb Balls	11@11¼c	
Cotton Wrapping, 5 Balls to lb	15@16c	

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25
Prentiss.....dis 20
Stephen's.....dis 25@30
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 10@15
Howard.....dis 30
Maneer's machinist.....dis 50&10

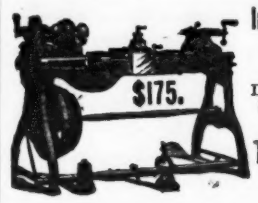
Wire.

New List, Jan. 18, 1884

Brass and copper.....dis 20@25
Bright and annealed, Nos. 0@18...dis 70&10@75
" " Nos. 19@26..dis 75@75& 5
" " Nos. 27@36..dis 75&10& 5
Coppered Nos. 0 to 18, market list..dis 70@70& 5
Galvanized Nos. 0 to 18 " ".....dis 65&5
Tinned market Nos. 0 to 18.....dis 67½
Cast steel.....dis 50
Tinned Broom Wire.....dis 70&5@70&10
Annealed Fence, Nos. 8 and 9.....dis 75
Annealed Grape, Nos. 10 to 14.....dis 75
Stub's Steel Wire regular.....$6.00@lb dis 30

Wrenches.

Coe's genuine, cash in ten days.....dis 50
Girard Standard.....dis 70&10
Agricultural.....dis 75&10
Mechanics'.....dis 55&10,& 3
Bemis & Call's Combination .....dis 35
Donohue's Engineers.....dis 20&10
Lamson & Sessions Engineers.....dis 60
Billings & Spencer's Drop Forged.....dis 10
William's " " .....dis 10
Alligator " " .....dis 40



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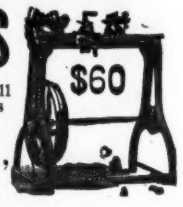
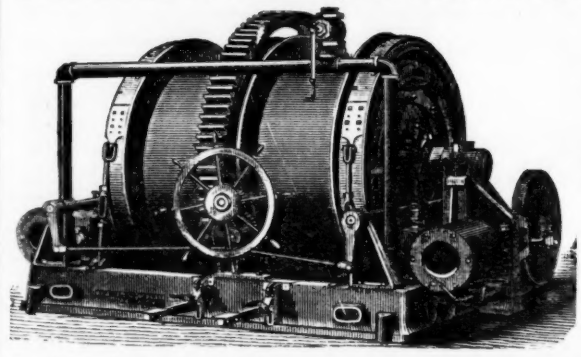


Webster, Camp & Lane Machine Co.



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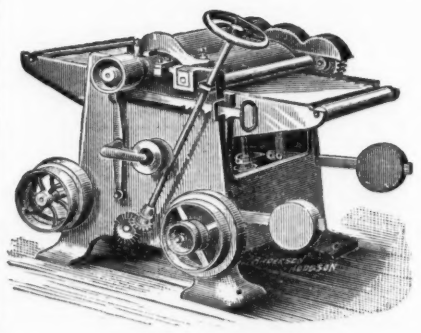

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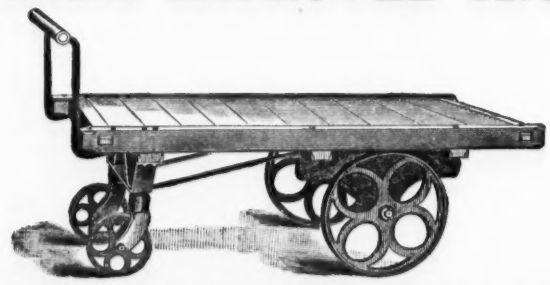

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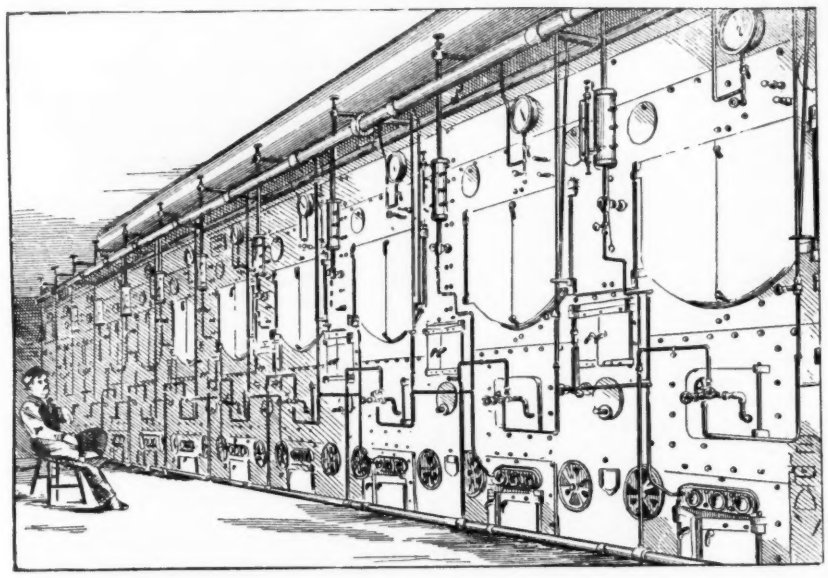

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HARDWARE MARKET.

Augers and Bits.

Common augers and bits.....dis 70
Snell's.....dis 60&5
Cook's Douglass Mfg. Co.....dis 55
Russell Jennings' augers and bits.....dis 25
Expansive Bits, Clark's small, $18; large, $26.....dis 35@35&5
Hollow Augers, Ives'.....dis 25&10
Hollow Augers, Bonney's Adjust. ℔ doz., $48.....dis 40&10
Hollow Augers, Stearns' Adjust. ℔ doz., $48.....dis 20&10
Gimlet bits, common.....per gross $2 75@3 25
Standard Bit Stock Drills.....dis 50&10&5
Ship Augers.....dis 15&10@15&10&5

Axes.

Makers' and Special Brands—
First quality.....℔ doz $8 00
Others.....℔ doz $7 00
Full polished.....℔ doz $9 00

Bolts.

Cast iron barrel bolts.....dis 70
Cast iron shutter bolts, etc.....dis 70
Cast iron chain bolts.....dis 65&10
Ives' patent door bolt.....dis 60
Wrought iron barrel bolts.....dis 70
Wrought iron square bolts.....dis 70
Wrought shutter bolts.....dis 60&10
Sargent's list
Carriage, common, new list.....dis 70&12½
Tire, common, new list.....dis 70
Carriage and tire, Philadelphia pattern.....dis 75&10
Stove bolts.....dis 60
Plow bolts.....dis 60&5
Machine.....dis 75&10@80
Ends.....dis 75&10&80

Buckets, Elevator.

.....dis 50&10

Butts.

Wrought brass.....dis 75&10
Cast brass, loose joint.....dis 33⅓
Cast Iron—
Fast joint, narrow.....dis 50&10&5@60&5
Fast joint, broad.....dis 55&10&5@60&10
Loose joint.....dis 70
Loose joint, jap.....dis 70
Loose joint, jap. with acorns.....dis 70
Loose pin, acorns.....dis 70
Loose pin, japanned acorns.....dis 70
Loose pin, acorns, jap. plated tips.....dis 70
Wrought steel—
Wrought, fast joint, narrow.....dis 70
Wrought, fast joint, broad.....dis 70
Wrought, loose joint, broad.....dis 70
Table Butts, back flaps, etc.....dis 70
Regular inside blind.....dis 70
Light inside blind.....dis 70
Loose pin.....dis 70
Light loose pin.....dis 70

Chains.

Trace, 6½-10-2.....℔ pair 1.03
Trace, 6½-10-3.....℔ pair .92 } 50&10@50&10&5
Trace, 7-10-2.....℔ pair 1.11
German Halter Chain, list June, 1887...dis 50&10
German Coil, list of June, 1887..dis 50&10&5@60
Galvanized Pump Chain.....℔ 15¼@16
Jack Chain, Iron.....dis 75@75&5
Jack Chain, Brass.....dis 70@70&5

Chisels.

Socket Framing and Firmer.....dis 75
Socket Framing and Firmer, Buck Bros..dis 30
Socket Firmer and Framing, L. & I. J. White.....dis 30@30&5
Tanged Firmers.....dis 40&10

Cutlery.

Table.....net
Excelsior Pocket.....net

Fibre Ware—Standard.

	Nos. 1	5.	5X.
Pails, water, 12 qt	$4 00	$4 50	$.....
Dairy, 14 qt	4 50	5 00	.....
Fire 12 qt	5 00	.....	.....
Sugar	6 00	6 50	.....
Horse	.....	5 00	.....
Buggy	4 00	.....	.....
Chamber Slop Commode } 5 and 5X 14 qt.	6 50	7 50	8 50
Jars, slop, 5 and 5X 14 qt	8 00	9 00	10 00
Basins, wash—			
10½ inch	2 00	2 25	.....
12 inch	2 25	2 75	3 25
13½ inch	2 75	3 25	3 75
15 inch	3 25	3 75	4 25
Bowls, fruit	.....	2 50	.....
Servers, 12 in	.....	2 25	.....
Baskets, waste paper, 13 in	.....	6 00	.....
Spittons, "Daisy," pressed			
8 inch	4 00	4 50	5 00
10 and 11½ inch	6 00	6 50	7 50

No. 1 plain; No. 5 decorated; No. 5X White decorated.

Gimlets.

Nail and Spike.....dis 50&10&5
Double cut, low list.....dis 25
"Bee".....℔ gross $12, dis 25@25&5

Hangers.

Barn door, old patterns.....dis 10&10@70
Climax, (Anti-Friction).....dis 70
Star.....dis 40&10@40&10&5
Scranton.....dis 40
Kidder's.....dis 50&10@60
Terry's Patent.....5 in., $12; 4 in., $10, dis 50&5
Paragon.....dis 40&10
Richard's.....dis 30@30&10

Horse Nails.

	No. 10	9	8	7	6	
Ausable, ℔ M.	23	24	25	26	28.	dis 25&10@25&10&10
Putnam, ℔ M.	18	19	20	21	23	dis 15
Essex						dis 25&10@25&10&10

Horse Shoes.

Burden, at factory.....℔ keg $4 00
R. I. Horshoe Co., Perkins' Imp. at factory.....℔ keg $4 00
Mule Shoes, at factory.....℔ keg $5 00

Knobs.

Carriage, japanned.....℔ gross 80c dis 60&10
Base, rubber tip.....dis 70&10&5
Hematite door knobs, new list.....dis 40&10@50
Door mineral.....dis 65c@68c
Door Por. japanned.....dis 75c@78c
Door Por. nickle.....$2 00@2 25
Door Por. plated.....$2 00@2 25

Locks, Bolts, Etc.

P. & F. Corbear, Locks and Bronze Goods.
Door locks, knobs and latches.....dis 60
Escutcheons and keys.....dis 60
Padlocks and padlock keys.....dis 66⅔
Bell pulls, mineral, porcelain and jet.....dis 60
Bell pulls, genuine bronze.....dis 60&10
Lever bell pulls, genuine bronze.....dis 60&10
Butts', genuine bronze.....dis 60&10
Butts' bronze plated.....dis 60&10
Store door locks and latches.....dis 60&10
Store door handles.....dis 60&10
Shutter hinges&flaps, genuine bronze.dis 60&10
Shutter hinges, bronze plated.....dis 70
Flush bolts, genuine bronze.....dis 70
Shutter knobs, genuine bronze.....dis 50
Shutter bars, genuine bronze.....dis 60
Sash lifts, genuine bronze.....dis 60
Sash pulls and plates, genuine bronze.....dis 60
Push plates, genuine bronze.....dis 60
Drawer pull, genuine bronze.....dis 66⅔
Letter box plates, genuine bronze.....dis 60&10
Barn door locks.....dis 33⅓
Bishop's Buckeye Sash Locks.....℔ gross $4.80

Plumbs and Levels.

Standard list.....dis 70&10@70&10&10
Pocket levels.....dis 70&10@70&10&10
Davis' inclinometers.....dis 10&10

Pumps.

Cistern, best makers.....dis 50&10@00
Pitcher spout, best makers dis 60&10@60&10&10
Pitcher spout, cheaper goods dis 70&5@70&10&5

Pokes, Animal.

Bishop's I. X. L.....℔ doz $6 00
Bishop's O K.....℔ doz $5 25
Bishop's Pioneer.....℔ doz $3 75
Bishop's American.....℔ doz $2 75

Rakes.

Cast steel.....dis 65&5
Malleable.....dis 70@70&5

Razors.

J. R. Torrey Razor Co.....dis 20
Wostenholme & Butcher.....$10@4...dis 10
Rifle razor.....dis $9 50 net

Scales.

Hatch, Counter, No. 171.....℔ doz $21 00
Hatch, Tea, No. 161.....℔ doz $5 75@7 00
Chatillon's Grocers.....dis 50
Family Turnbulls.....dis 30@30&10
Scale Beams, List of January 12, 1882.....dis 50&10@50&10&4

Screw Drivers.

Stanley R. & L. Co.'s Varnished Handles.....dis 65&10
Stanley R. & L. Co.'s Black Handles..dis 60&10
Sets interchangeables.....℔ doz $18 dis 25

Squares.

Steel and iron, Nickel plated } dis 75&10@80
Disston's try square and T bevels.....dis 45&10
Winterbottom's try and miter.....dis 30&10

Tacks, Brads, Etc.

New List, January 2, 1888.

American iron carpet tacks all kinds.....dis 70&5
Steel carpet tacks all kinds.....dis 70&5
Swedes iron carpet tacks, all kinds.....dis 70&5
Swedes iron tacks.....dis 70&5
Swedes iron Upholsterers' tacks.....dis 70&5
Tinned Swedes iron tacks.....dis 70&5
Tinned Swedes iron Upholsterers' tacks.....dis 70&10
American iron cut tacks.....dis 67½&5
Copper tacks.....dis 50
Copper finishing and trunk nails.....dis 50&00
Cigar box nails.....dis 45&10
Finishing nails.....dis 65
Hungarian nails and miners' tacks.dis 62½&5
Gimp and lace tacks.....dis 70&5
" " " tinned.....dis 66&10
Trunk and clout nails.....dis 66⅔
Tinned trunk&clout nails.....dis 66&10
Basket nails.....dis 66&10
Chair nails.....dis 66&10
Common and patent brads.....dis 66&10
Tinned capped trunk nails.....dis 60

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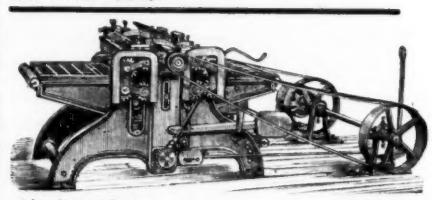

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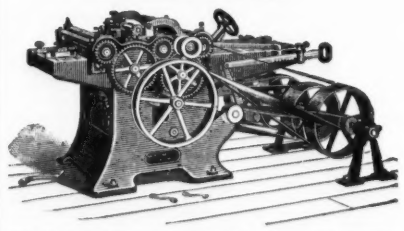

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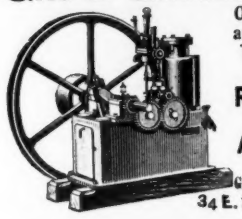

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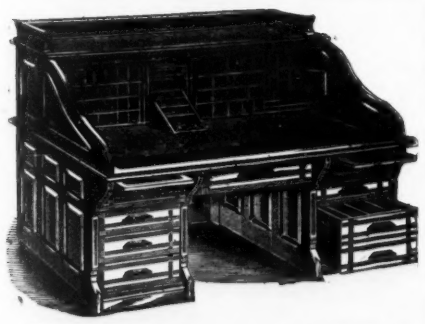

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Youngstown Local.....	†8 05 a m	
Mahon'g div. & Pitts Local		*11 40 a m
Mahoning Val. Accom.....		†4 30 p m
Pittsburgh Express.....	†1 20 p m	11 10 p m
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(Standard Gauge.)

Depart for—

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Canton—6:50 a. m., 3:00 p. m., 6:20 p. m.
Kent—6:50 a. m., 3:00 p. m., *5:45 p. m. 6:20 p. m.
Bedford—6:50 a. m., 11:10 a. m., 1:30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m. 10:35 p. m.
Newburgh—6:15 a. m., 6:50 a. m., 11:10 a. m., 1.30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m., 10:35 p. m.

Arrive from—

Zanesville and Coshocton—10:30 a. m.,6:30 p. m.
Canton, 10:30 a. m., 2:35 p. m., 6:30 p. m.
Kent—*8:10 a. m., 10:30 a. m., 2:35 p. m., 6:30 p.m.
Bedford—6:00 a. m., *8:10 a.m., 10:30 a.m., 1:05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p.m., 7:10 p.m.
Newburgh—6:00 a. m., 7:15 a. m., *8:10 a. m., 10:30 a. m., 1.05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p. m., 7:10 p. m.

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	Depart.	Arrive.
For Pittsburgh, Baltimore, Washington, Philadelphia and New York.	8 00 a m	d5 25 a m
	1 15 p m	12 50 p m
	d11 10 p m	6 35 p m
Wheeling and Bellaire.	8 00 a m	12 50 p m
	1 15 p m	6 35 p m
	*11 10 p m	.....
Alliance Accom.	3 25 p m	9 40 a m
Ravenna Accom.....	5 00 p m	8 25 a m

d Daily. * Except Saturday. Other trains except Sunday.

From Cleveland Union Station.

Mt Vernon and Pan Handle Route

Cleveland & Pittsburgh R. R.

	Depart.	Arrive.
For Cuyahoga Falls, Akron, Orrville, Millersburg, Gambier, Mt. Vernon, Columbus Xenia, Dayton, Cincinnati, Louisville, Indianapolis, St. Louis, and all points in the South and Southwest.	8 10 a m	d 7 00 am
	d 8 00 p m	5 40 p m
For Cuyahoga Falls, Akron, Orrville, Millersburg, Zanesville, Gambier, Mt. Vernon and Columbus.	1 15 p m	12 50 p m
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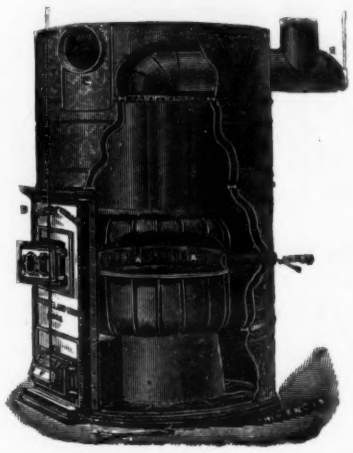

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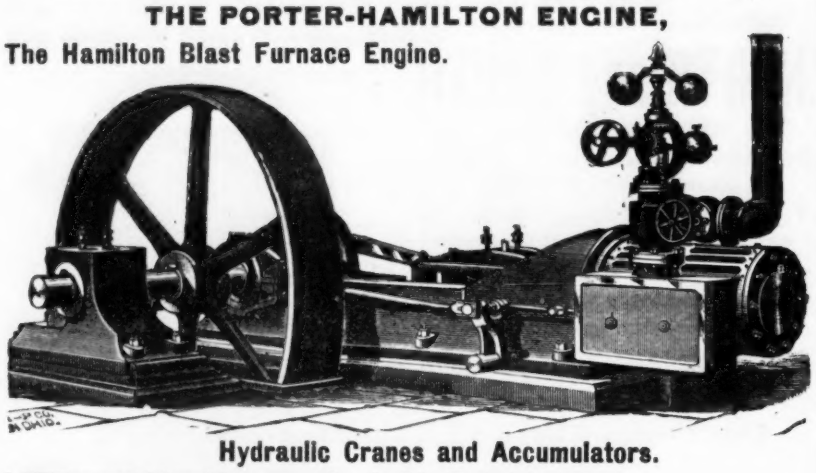

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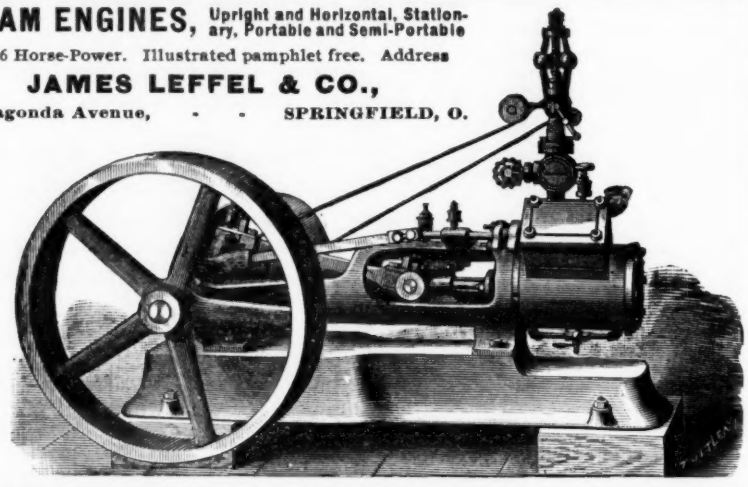

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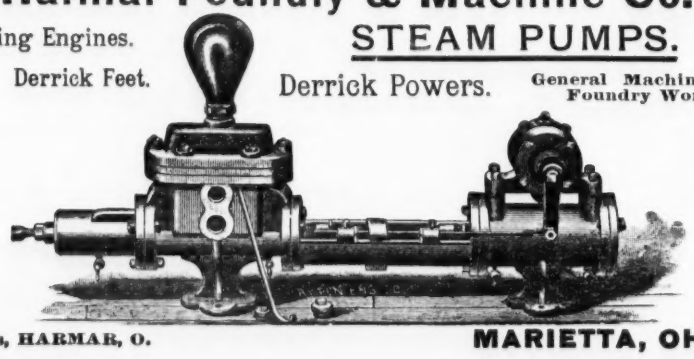

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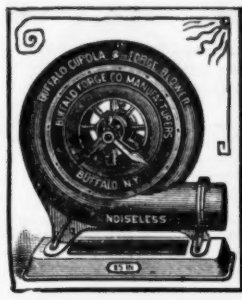

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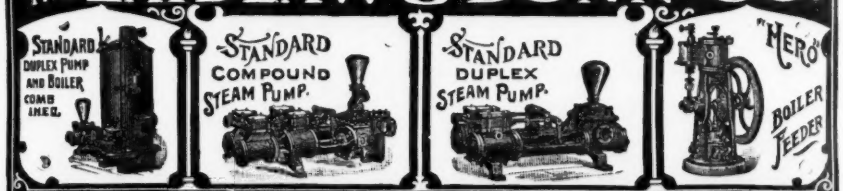

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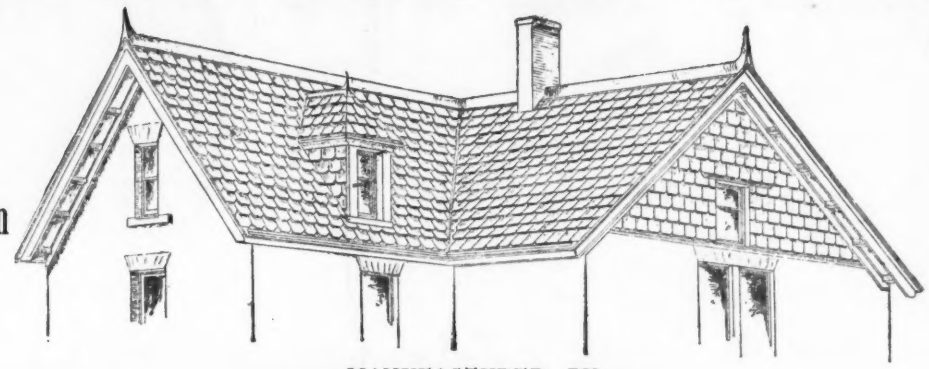

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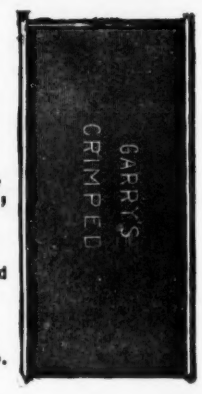

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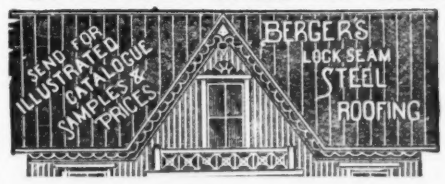

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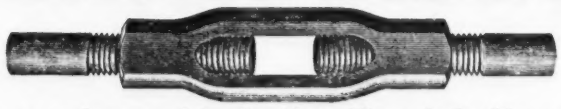

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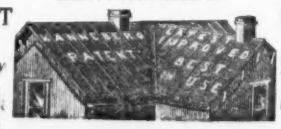

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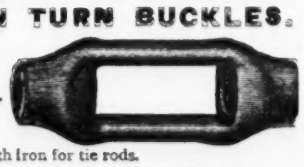

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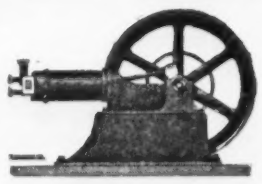

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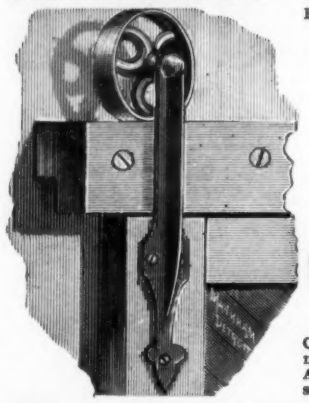

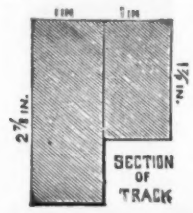

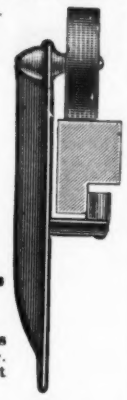

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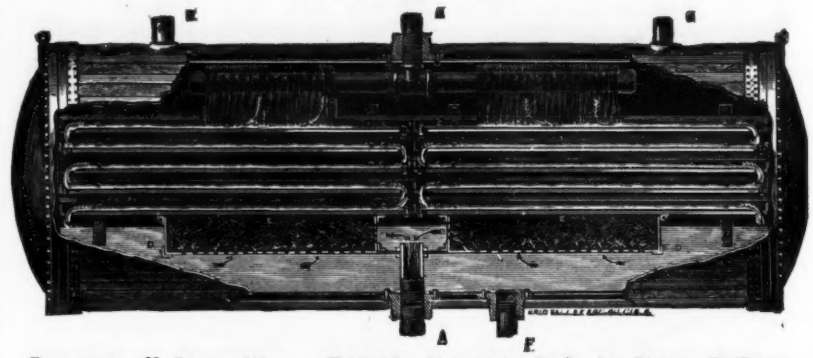

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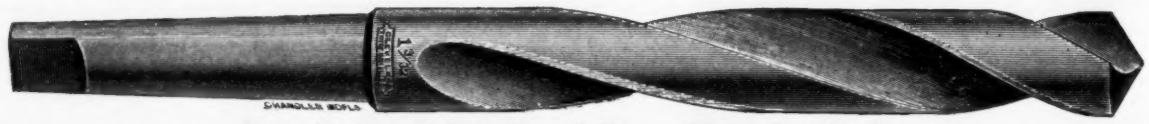

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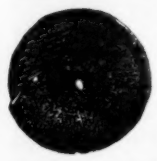

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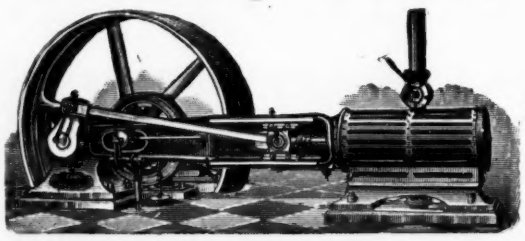

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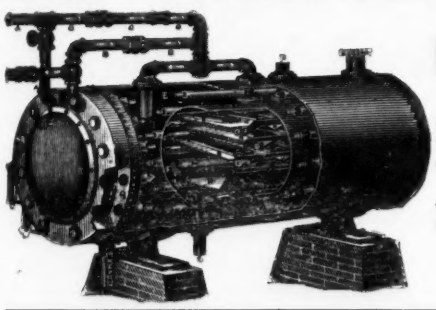

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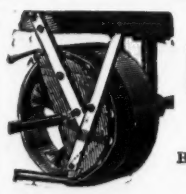

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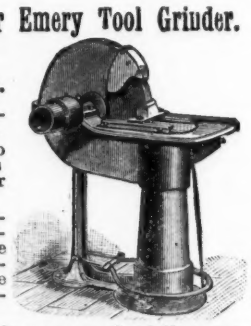

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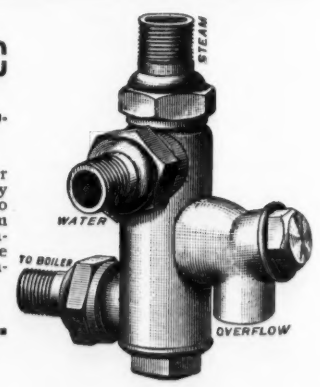

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